RAILROAD GAZETTE

FRIDAY, MAY 15, 1903.

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Contributions

Classifying Locomotives.

Albany, N. Y., May 8, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to your issue of April 3, 1903, in which you ascribe to Mr. Whyte, of the New York Central, the origin of the decimal classification of locomotives based upon his suggestion to the 1901 meeting of the Master Mechanics' Association and the adoption of this classification by the American Locomotive Company:

I beg to refer you to my communication signed "Roadmaster," published in your issue of Dec. 7, 1900, in which this classification was suggested. I have no desire to detract from the credit due to Mr. Whyte for suggesting this simple and sensible method of classifying locomotives, but only desire to claim the credit of its origin.

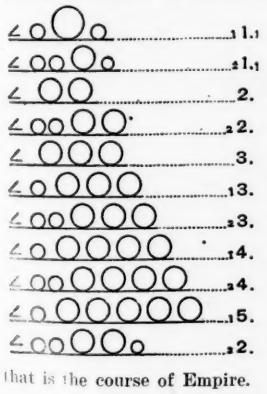
C. E. LINDSAY,
Division Engineer N. Y. C. & H. R. R. R.

[Mr. Lindsay is quite right in this statement and in order to make the record clear his letter suggesting the new nomenclature is reproduced below.—Editor.]

November 3, 1900.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The arbitrary and incomprehensible methods of classifying locomotives on different railroads has perhaps not impressed itself upon you. In the interest of a uniform method of classifying locomotives I suggest the one shown on the sketch. With this as a basis such prefix or affix letters could be added showing cylinder dimensions, style of fire-box, or kind of fuel, etc., as may be necessary. You will see that the class number suggests the number of wheels and the arrangement is as of a locomotive headed West, as that is the course of Empire.



ROADMASTER.

Delaware, Lackawanna & Western Discipline.

Hoboken, N. J., May 11, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Please let me supplement your advocacy of strict discipline with some concrete facts in what I believe to be an enlightened method of discipline of the locomotive engineers on the D., L. & W. The manner of it, as well as the method in it, is important, and this makes it as hard for me to describe as it was hard for me to learn it; for a superintendent who works conscientiously to get a high standard of efficiency among his runners is usually found to do it so quietly and so modestly that the culprits know more about it than anyone else does.

In commenting on the Westfield and other similar accidents you call attention to prevalent heedlessness, to the fact that engineers do not discipline themselves and to the lack of systematic discipline by their superiors. In general—that may be true, but it is not true here. The difference between good discipline and the other kind is obedience, patient attention to details and unceasing watchfulness. The fact that the superintendent gives his personal attention to this work is essential, and the quality of the superintendent himself is vital. These are elements. Maintaining a train service which gives safety to the passengers and trainmen, with punctuality and proper attention to the passengers' wants, is not unlike the job which Admiral Sampson set himself before Santiago. There must be an adequate force of capable men, with one great man at the head, who is near enough so that he can at any moment put his finger on any detail. This was the secret of Sampson's success. It was also the secret of the admirable discipline which Colonel Hain established on the Manhattan Elevated Railroad. He himself watched the details, although not a small man capable of nothing above details, for he was large enough to decide policy also. He knew the details always, but actually dealt with them only when it was necessary. This is the secret of success as a manager of a force of hundreds of trainmen: Know how to keep in touch with everything, while not wearying yourself with the burden of doing everything.

On the Lackawanna the superintendent deals with the hard questions at first hand. He takes the time necessary for it, whether a given case requires three hours or three days. At the recent New York Railroad Club discussion on discipline Mr. Adams asked how a busy superintendent was going to get time to give a lot of two-hour admonitory talks to men who had made a mistake and needed a delicate combination of instruction and reproof; and the question was not answered. The Lackawanna superintendent *takes* the time. He believes that he can make no better use of the hours for which the company pays him.

Take the case of Engineer Smith, who has caused a little collision by a combination of three or four kinds of wrong reasoning. He trusted to the brakeman to do a bit of flagging, which every engineer knows that brakemen sometimes shirk. He eased his own conscience by the thought that the fireman was partly responsible, although he knew that he himself was charged with the duty of instructing the fireman; and he trusted partly to luck, as an engineer will sometimes do unless he is frequently disciplined, either by himself or by his boss. Now, in the first place, the superintendent goes patiently over the simple facts, so as to put them in the right order. He does this repeatedly, if necessary. Confusing the facts and failing to see their true relative importance is an easy and common error among men who otherwise are excellent engineers. A superintendent who is fair and considerate, and who is himself thoroughly posted on the conditions under which his men work, can usually get an intelligent and conscientious engineer or conductor to pronounce his own condemnation, if condemnation is deserved. (Of course, if the upright superintendent makes any mistake at this point—condemns without justification—he must set himself right before attempting any further judicial work.)

Where a man does not promptly see the superintendent's reasoning he is told to go home and think it over. This is only simple fairness. Did you ever stop to think that in our courts the accomplishment of justice without unnecessary friction often depends on a day's or a week's delay, giving the parties time to reflect? The superintendent who means to treat his men "square," and who wishes to have them know that he is square, must keep this point in mind. On the other hand, when you cannot frankly explain the reason for postponement you run the risk of doing more harm than good. There is not much use in laying men off to give them time to reflect on their past misdeeds, unless you guide their reflections by giving them a definite line of thought.

In lecturing an engineer on the need of caution in trusting brakemen, the superintendent has a lesson to impart which is simple but often is hard to impress. It is that leaving a duty to a subordinate must be a positive and not a negative matter. The engineer or conductor must not constantly assume that the brakeman is competent, and that he is to be watched or instructed when occasion requires; the assumption must be that he is not fully competent; that he must be watched always and be instructed on every occasion; this rule not to be suspended unless he deliberately decides in this (and each) particular case that it is necessary to suspend it. This idea usually cannot be pounded into the engineer's head on the first attempt; the superintendent has to patiently repeat it. The idea of deliberation in a matter of this kind is almost foreign to some engineers; they must be made to understand that a deliberation lasting 30 seconds is far different from no deliberation, and often meets the need. In short, the engineer or conductor, every time he sends a man on any important errand, must be able to say definitely to himself, and to the superintendent afterward, that the order was given after due reflection.

If the reader thinks the above paragraph is an impracticable refinement, let him read any book of rules for trainmen. Allowing for the extreme brevity and terseness that is the fashion in American train rules, those rules will be found to embody this idea.

Most engineers need a lecture on their duty as educators of firemen. Many are repellant, if not overbearing, and they do not realize it because they do not realize the need of the firemen's monitorship as a check upon themselves. They are told to keep the instruction of the fireman constantly in mind. Firemen who do not ask to be examined for promotion within a given number of years after they begin firing are assumed to be men who will never be able to fit themselves for runners; and an engineer who neglects to assist an intelligent fireman in getting the best out of himself, is doing him damage, besides needlessly hampering the superintendent in his effort to make a corps of efficient firemen. To a fireman, as to a brakeman, the engineer must delegate duties only after a careful survey in each case. Perhaps the survey takes only 15 seconds; but it is a survey, nevertheless.

The old and threadbare exhortation to engineers to have a care for their own lives has to be reiterated, though not in the usual way. Some superintendents think that this duty is too plain to be spoken of; that an engineer will look out for himself as surely as you or I would avoid walking through a fire; but this view ignores the facts of everyday experience. Not the life of himself or of 200 passengers, the comfort of his family or the interests of his fellow trainmen, will correct a wrong habit, unless the engineer reasons out the relation of the habit to the demands upon him. And the superintendent who harps on the single string of the engineer's own personal safety is about as far out of the way as the one who says nothing. His duty must be laid before him without much direct reference to the life-and-death question; mention of that is only useful as an introduction. He must do his duty so as to protect life, but so far as the superintendent's present duty is concerned there is no more direct connection than between passengers' lives and the making of an axle or adjusting a track relay. The blacksmith does his duty in forging the axle by reason of the same consideration that would apply if he were making a safe-lock, where a mistake would involve nothing worse than financial loss. He simply follows to the best of his ability the most approved rules of the axle-making art. Aiding him to do this is the only duty of his instructor. The signal maintainer may think of possible collisions and their tragic results, but his practical aim is rather to show an honest record of the fewest possible signal failures in a million signal movements. It is the same in instructing engineers; and this means study and re-study of the courses of action—that is, the habits—which have been found most satisfactory by conscientious, alert and strong-minded engineers in the past. This is the only rational way for an engineer to look out for his own safety.

The engineer who trusts to luck probably does so, oftener than for any other reason, simply to avoid petty censure. He would not think of risking passengers' lives to save his job; but he overruns a signal to save making a written report of delay, or to avoid an unpleasant two-minute interview; and in doing this he may kill his fellow employees. To such a man the superintendent has to talk in a friendly way to convince him that sticking to the rule "safety first and speed afterward" will not "set him back" in any sense of the word. This the Lackawanna superintendent does. Of course, no superintendent can make such a promise unless he is able to carry it out. Real friendliness to the engineer cannot be put on temporarily like a rubber coat. The superintendent must, first, have the "sand" to meet his superior, of whom the passenger department demands good time in spite of a crowded road, heavy trains or long block sections. Second, he needs the assurance of security in his own position. Third, he needs a body of engineers of intelligence and moral character. Even with the best and most friendly superintendent in the world, the engineer must have courage to come in 10 minutes behind time. Runners with weak moral characters are not equal to it. They prefer to take chances.

The virtues of the Lackawanna administration seem to me to be a painstaking cultivation of an ethical standard and a real accessibility to the division superintendent by all engineers and conductors; such an attitude on the part of the "old man" that the men actually feel free to open their hearts to him. The superintendent frankly tells his men that he is going to look out for his own reputation; that he will always rigidly discipline and punish, so that when a fatal accident occurs and the grand jury inquires how he runs his road, he may have a straight story to tell, a record that will bear inspection. I need not tell your readers that in thus setting a high standard for himself, the superintendent sets the pace for his subordinates. In the army, or in a great bank, it is a basis rule to be always ready for inspection. It should be adopted as the rule of the railroad.

F. H. X.

New Rules on the C., St. P., M. & O.

The Chicago, St. Paul, Minneapolis & Omaha has lately put in use a revised code of rules for the operating department, and in doing so has made more systematic examination of its men than ever before. The new book has supplementary rules indicating that the work has been done with care. The colored illustrations, to show the position of lamps and flags, are printed with the rule (19) and not by themselves at the back of the book. At meeting points conductors have to register verbally with each other, except in the case of passenger trains which do not stop. The time interval, where the block system is not used, is 10 minutes for all trains. At meeting points between trains of the same class the inferior must clear the superior five minutes. Rule 98b, like the similar rule on the Chicago & North Western, requires freight

conductors to get an order or a clearance at every telegraph office. Passenger conductors must do the same, with certain exceptions. Rule 99, with its supplementary rules, fills nearly two pages. Rule 104 says that switches other than main track and derailing switches have no normal position; care must be exercised in using them.

In train orders the conductor's name is always given in the body of the order, following the number of the train. The old-fashioned signals "12" and "13" are used in orders.

The telegraph block signal rules are numbered 300 to 353 inclusive, with a number of supplementary rules interspersed. Rule 314 specifies five different uses for the caution card. A clear block signal gives right only to the first switch reached at the next block station. The rules for automatic block signals are numbers 500 to 522. Directions are given for use with both semaphores and (Hall) discs.

The interlocking rules are numbered 600 to 659 inclusive. The remaining chapters deal with the telegraph and signal department, the passenger service, the freight service, accidents, air brakes, etc.

For the examination of employees 10 different forms are provided, each being a book 8 in. x 10 in., with questions and blank spaces for answers. Besides the printed questions, the examiner is told to ask questions concerning special rules on the time-table. The ten forms are for the following classes: Conductors; track, bridge and building foremen; agents, yardmasters and switchmen, firemen, operators, train despatchers, enginemen, brakemen and baggagemen, signalmen at interlocking plants. The catechisms are quite full, though the critic may find any number of questions which could easily be improved. The conductor has to write answers to 70 questions about train-orders. An officer of the road writes as follows:

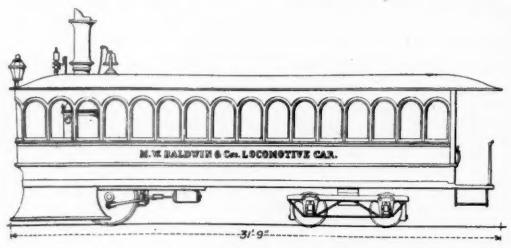
"The examinations have been conducted at the division termini, at the larger places in vacant offices, and at other points in coaches, several of which were fitted up with small tables between the seats. From among the engineers and conductors, there were appointed a number, those of known capability, to act as proctors or supervisors, their business being to remain with the men who were taking their examinations—to see that the men kept at their work, and did not assist each other in answering the questions. These proctors had first passed examinations, and were thoroughly instructed as to all the details. They were particularly enjoined to make no interpretation of any of the rules. Where the exact meaning was questioned, the question had to be referred to the Division Superintendent. The number of sittings to complete the examination of a conductor or engineman was limited to three; that is, the men were not permitted to write the answers to a few questions at a time, and so drag the examination along indefinitely. Other employees were allowed to retain their books while filling out the blanks, but the two classes first mentioned were relieved of their books when entering the examination room. The books were returned to them when they had completed work for the day. The number of examinations was limited to three; that is, any men who could not, in three different examinations of three sittings each, answer all the questions correctly would be taken out of the service until after the new book of rules had been put in force, each such case then receiving special attention. There was no occasion, however, to enforce this rule, and it was found that almost invariably men were able to pass a satisfactory examination the second time.

"We have had no difficulty whatever with the examination; in fact, we have hardly felt that a change was being made, except in so far as the checking of the examinations is concerned. This, of course, was quite burdensome, in consequence of the amount of time required.

"In addition to the printed examination, the telegraph operators were subjected to an oral examination for the purpose of putting questions which might occur to operators in connection with train orders and the movement of trains."

Suburban Locomotive Development.

It is interesting to trace the development of the suburban type of American locomotives. The first locomotives for suburban work were steam motor cars. The record of the Baldwin Locomotive Works shows that the first one of this type was built in the early part of 1860 for the Pennsylvania. It was named "Novelty," and consisted of a passenger car with an upright boiler in a compartment at the front. A single pair of driving wheels supported the front end of the car, and an ordinary four-wheel truck carried the rear end. The cylinders were horizontal, 5 in. x 12-in., and were secured to the underframing; the driving wheels were 42 in. in diameter. The car would seat 40 passengers and weighed 16,000 lbs. It was used in local passenger service by the Pennsylvania for a time, but not proving entirely satisfactory for this traffic it was removed to the Pittsburgh, Ft. Wayne & Chicago and used as a pay car. Our illustration was prepared from an early sketch, loaned by the Baldwin Works. Memoranda on this sketch indicates that other roads in the vicinity of Philadelphia were considering the design. Similar cars built by Grice

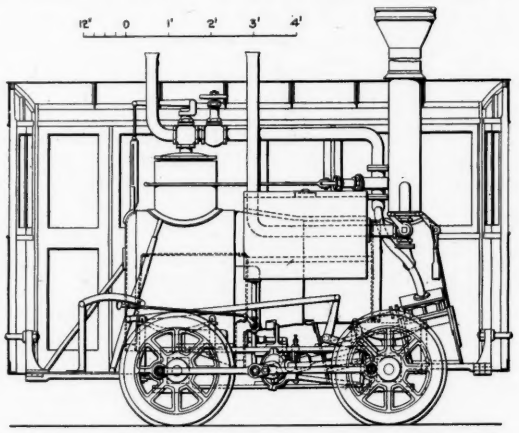


Steam Motor Car "Novelty"—Baldwin Locomotive Works, 1860.

& Long, of Philadelphia, were used on the suburban roads of that city in the 70's, and apparently gave satisfactory service. However, the idea of having the steam power combined with the vehicle for carrying the passengers was open to a number of serious objections and was finally abandoned.

The type which is regarded as best suited for suburban traffic is the developed Forney type, designed and patented about 30 years ago. The object of this design was to carry all of the weight of boiler and machinery on the driving wheels, making it available for adhesion and at the same time to have a short rigid wheel-base to enable it to pass around curves with ease, and a long and flexible total wheel base to give steadiness when running. The frames were extended backward from the fire-box and supported the tender, the weight of the latter being carried on a four-wheel truck. It was intended that these locomotives should run tank-end first, in order that the truck wheels should guide. It was found, however, that they would run equally well in either direction and thus came to be known as double-enders. But while the Forney type, or some modification of it, is the popular type, it has not been without its strong competitors.

The building of the New York elevated railroad called for a suburban type of engine and the first to be used was designed by Mr. D. W. Wyman, Superintendent of the road. This engine, an illustration of which is shown,



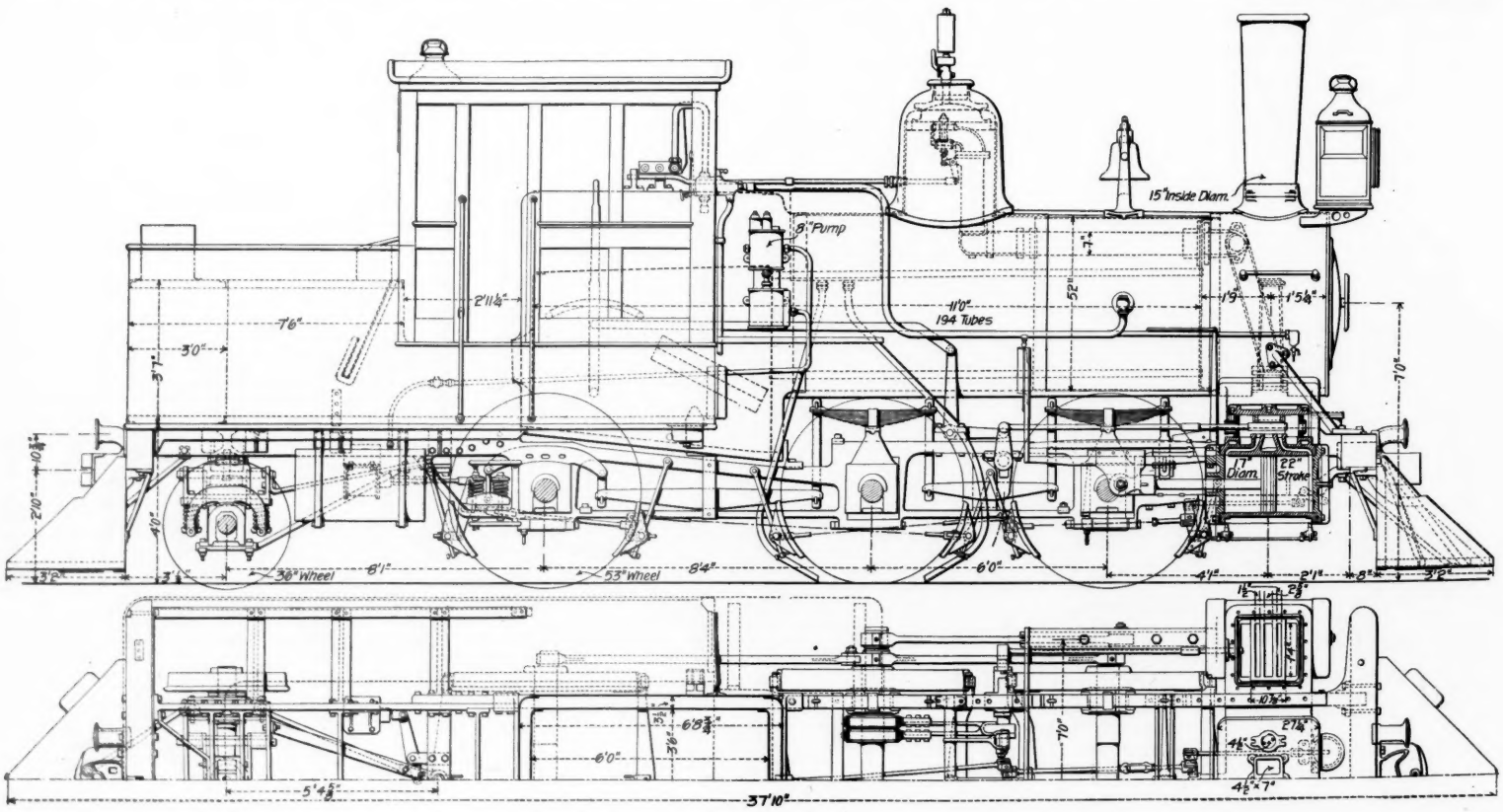
The Wyman Suburban Locomotive—New York Elevated, 1874.

had 7 in. x 10-in. inclined cylinders and was carried on four wheels, 30 in. in diameter. The cylinders were placed between the frames and in front of the forward axle. A crank shaft was placed midway between the front and rear wheels, having outside cranks and parallel rods on each side for connection with the driving wheels. A small saddle tank was placed over the boiler. The exhaust pipe had two branches, one leading directly to the stack and the other passing through the tank and then through the roof of the cab. The engine was housed in, as may be seen from the engraving. The weight was about 8,000 lbs.

With the extension of the line, and the increase of traffic demanding heavier trains and higher speeds, the subject of motive power came up for exhaustive consideration. The Forney type was favored by some while others preferred the original four-wheel type, an order finally being given for 10 of each type.

The Forney engines weighed approximately 26,000 lbs. loaded, with 16,000 lbs. on drivers. The cylinders were 10 in. x 14 in., and driving wheels 38 in. in diameter, with a 5-ft. rigid wheel base. The four-wheelers had the same dimensions, except the wheel base was 6 ft. That the Forney engines gave the most satisfactory results was indicated by a subsequent order for 25 having the same cylinder and driving wheel dimensions, but heavier, and with a longer rigid wheel base.

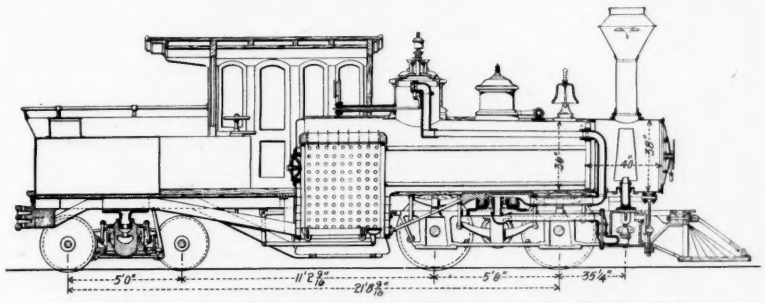
About this same time some much heavier locomotives of the Forney type were built for several different roads to be used in suburban traffic. The heaviest of these were for the New York & Harlem, three of which were used on local trains between New York and Williamsbridge, a distance of 11 miles. The object at the time was to provide very powerful engines to handle trains for excursions, races, etc., with frequent stops. These engines had 15 in. x 20-in. cylinders and weighed 72,000 lbs., with 49,500 lbs. on drivers. The total wheel base was 20 ft. 11 in. Another lot built for the Indianapolis



Class I Suburban Locomotive—Chicago, Burlington & Quincy, 1889.

& Evansville had cylinders of the same size but carried only 45,325 lbs. on the drivers. A single locomotive having less total weight but greater adhesive weight than either of the above was built for Morgan's Louisiana & Texas Railroad and was used for pushing freight cars up a steep incline on the levee of the Mississippi River, and for hauling these same cars over the road. The weight on drivers was 56,000 lbs. out of a total of 70,000 lbs. The cylinders were 17 in. x 24 in.

In 1876 a design novel to American practice was brought out by the Mason Machine Works, Taunton, Mass. The general design was originated by Mr. Robert Fairlie, of England, but the details were Americanized. The peculiarity about these engines was the use of a "bogie" truck under the boiler. The cylinders and driving wheels were mounted on this truck, which was free to turn around a center pin and adjust itself to track curvature. On a number of engines of this type built for narrow-gage roads the center pin for the truck was held by a cast-iron saddle fastened to the boiler. It was pointed out that this arrangement might be entirely practicable for small engines, but shocks and strains of a large locomotive would be very injurious to the boiler. For large engines the center pins of both trucks were attached to a main frame extending from one to the other.

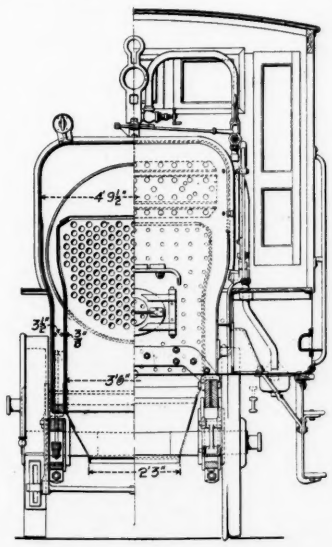


The Fairlie Suburban Locomotive—Mason Machine Works, 1876.

The steam pipe was carried through the front tube sheet and down through the bottom of the smoke-box to a junction with a horizontal pipe running back beneath the boiler barrel and connected with the saddle casting supporting the boiler. A pipe passed down through the center of the saddle, having at its upper end a ball and socket joint and also being surrounded by a stuffing box. Another horizontal pipe, joined to this vertical pipe, passed forward to branch pipes leading to the cylinders.

The exhaust pipe was bolted to the cylinder castings and passed into the smoke-box through a casting riveted to its under side, and having an opening oblong in shape to allow the pipe to move with the truck. The lower surface of this casting was horizontal and against which a flat plate attached to the exhaust pipe was pressed by a spring. We show a drawing of this type of engine, giving some of the details, a study of which is interesting.

Ten years later, or in 1886, a special design of this type was built for use in suburban service on the Providence, Warren & Bristol. In order to enable trains to be worked into and out of Providence in the usual manner, that is, without using a backing-out switch, a curve was put in which, due to the topography of the country, had a radius of 211 ft. The sharpness of the curve made necessary a special form of engine and one was designed at the Mason Machine Works. This was a standard-gage locomotive with 16-in. x 24-in. cylinders, and it had a total weight of 126,300 lbs., with 61,800 lbs. on drivers. It was a three-truck design, there being a two-wheel leading truck, two pairs of coupled drivers, and a six-wheel tank truck.



Class I Locomotive—C. B. & Q.

In 1889, after a careful study of the suburban locomotive problem, and an investigation of every possible or conceivable type regarded as suitable for this service, the Chicago, Burlington & Quincy brought out its Class I engine, which was a six-coupled engine with a two-wheel tank truck. This design is still used. It has cylinders 17 in. x 22 in. and drivers 56 in. in diameter. The coal capacity is 2½ tons and water capacity 1,600 gals. The tank extends under the cab except for a space in front of the fire-door where the fireman stands. The coal is carried on top of the tank and in the space between the legs. Coal boards are placed between these legs and the cab has a sheet-iron shield across the back. The total weight of the engine in working order is 113,000 lbs., of which 94,000 lbs. is on drivers. This makes the proportion of dead weight to total weight only 17 per cent., which is by far the most favorable figure of which we find any record for an engine with a guiding truck.

Considerable attention was given to locating the cab mountings so that they would be convenient to the engineman when running in either direction. The ash-pan was designed to enable the ready removal of the ashes, the frequency of the trips of the suburban engine making this desirable. The pan on these engines has two openings in the bottom.

The New York Central brought out a new design in 1891. Unlike the Burlington engine just described, this design had a two-wheel front truck and a six-wheel tank truck; the drivers were six-coupled. It was the heaviest suburban locomotive built up to that time, the total weight in working order being 169,000 lbs., with 95,000 lbs. on drivers. It will be noted that the weight on drivers is practically the same as for the Burlington engine, but the proportion of dead weight to total weight was 44 per cent. The cylinders were 18 in. x 22 in., and the drivers 64 in. in diameter. One of the points receiving attention was the placing of the engineman high enough in the cab to have a good view of the track in either direction and close to his engine. The water capacity was 2,300 gals., and 2¾ tons of coal could be carried. The fire-box was placed above the frames and was made sufficiently large to burn anthracite coal.

These engines proved unsatisfactory, however, as a result of their not having been properly proportioned to enable them to keep on the track in running through the cross-overs and switches at the Grand Central Station in New York. They were subsequently converted into ordinary mogul engines with tenders.

Contemporaneously with the New York Central design just described a new design, for the Chicago & Northern Pacific, was turned out of the Brooks Works. It had four drivers, and a four-wheel truck at each end, and in general appearance resembled an American type with side tanks, a rear coal bunker and a rear truck. Two criticisms of the design offered at the time of its appearance were, the obstruction to the engineman's view of the motion parts interposed by the tank and his inability to reach them while the engine was running; and the relation of dead weight to adhesive weight, the former being 44,000 lbs. and the latter only 56,000 lbs. The engine was designed to burn anthracite coal or coke and had a capacity for 2.6 tons of the latter; the tank held 1,600 gals. of water.

For its heavy suburban traffic at Chicago the Illinois Central uses three different forms of the modified Forney type. The standard of the road for this service is a four-driver engine with a two-wheel leading and four-wheel tank truck; the cylinders are 16 in. x 22 in. and the drivers 56½ in. The rigid wheel-base is 7 ft. and total wheel-base 31 ft. 9½ in. They carry 3½ tons of coal and 1,550 gals. of water. The total weight is 117,200 lbs., with 56,100 lbs. on drivers, or 48 per cent. of the adhesive weight. There are 21 of these locomotives in service, all of which were built by the company.

In preparation for the World's Fair traffic a number of heavier engines were added, of which there were two classes. One of these has four drivers, a two-wheel leading and a six-wheel tank truck, the total wheel base being 32 ft. 7 in., of which 6 ft. 10 in. is rigid. The cylinders are 17 in. x 24 in. and the drivers 56½ in. in diameter. The coal and water capacity is six tons and 2,500 gals., respectively. These are the heaviest engines in suburban service on this road, the total weight being 166,000 lbs. But the drivers carry only 72,000 lbs., affording a ratio of slightly over 43 per cent.

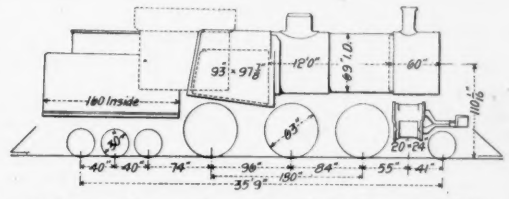
The other of the two classes mentioned has six drivers, a two-wheel leading and a four-wheel tank truck; cylinders 18 in. x 22 in. and drivers 56½ in., which latter, it will be noted, is the standard. The coal and water capacity is 5¼ tons and 2,100 gals., respectively. While having less total weight (160,000 lbs.) than the other class, 92,000 lbs. is available for adhesion, or 57½ per cent.

In addition to the engines just described, two light 18 in. x 24 in. ten-wheelers were recently converted into double-enders for suburban service, giving them a 4-6-4 wheel arrangement, with a total wheel-base of 34 ft. 3 in. With capacities for 6¾ tons of coal and 2,760 gals. of water they weigh 136,400 lbs., with 61,900 lbs. on drivers.

The most modern examples of the suburban locomotive are found in two types brought out last year by the New York Central and the Central of New Jersey respectively. These locomotives were described in detail in these columns at the time they were placed in service (*Railroad Gazette*, March 28 and June 20, 1902), so that reference will be made only to those points upon which comparisons of previous designs have been based.

Prior to the introduction of these double-enders the Jersey Central handled its large suburban business with American-type engines. One of the conditions affecting the adoption of the suburban type was a desire to expedite the movement at terminals.

Some 30 years ago this road owned two engines of a



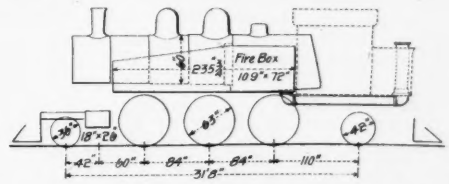
Suburban Locomotive—New York Central, 1902.

distinctly suburban type. These engines had a 2-4-4 wheel arrangement, with 57-in. drivers. They had 16-in. x 20-in. radial-bar cylinders, and weighed 84,980 lbs., with 60,920 lbs. on drivers. They proved unsatisfactory in suburban work and were relegated to switching, being finally scrapped.

The new engines are a 2-6-2 type with a total wheel base of 31 ft. 8 in. The cylinders are 18 in. x 26 in. and the drivers 63 in. in diameter. There is capacity for five tons of hard coal and 3,000 gals. of water, the tanks being of the side pattern and extending from the cab to the smoke-box. The boiler has a wide fire-box, the grate area being 54.5 sq. ft. The total weight is 165,000 lbs. The weight on drivers with a half supply of coal and water is 108,000 lbs., or 65 per cent. of the total.

The New York Central engines are the heaviest suburban locomotives ever built in this country. In designing them profit was obtained from the experience with the 1891 design. Liberal provisions for lateral play and clearance were therefore made. These engines are giving satisfactory service in handling the heavy suburban traffic.

They are a 2-6-6 type having a total wheel-base of 35 ft. 9 in., and a rigid base of 15 ft. The 20 in. x 24 in. cylinders have piston valves, inside admission. The boiler is the straight type, with two fire-doors and a wide fire-box, the grate area being 62 sq. ft. The tank capacity is 3,700 gals. and the coal capacity is five tons of anthracite. The total weight is 216,000 lbs., with 128,000 lbs., or 60 per cent. of the total, on the drivers.



Suburban Locomotive—Central of New Jersey, 1902.

Comparisons of the different designs described in the foregoing disclose wide variations; and particularly in the important ratio of adhesive to total weight. A good opportunity for comparison in this regard is furnished by the Burlington Class I and the New York Central 1891 design. With total weights of 113,000 and 169,000 lbs., respectively, they have practically the same weight on drivers, enabling them to draw equally heavy trains. After 13 years of service the Burlington still regards the Class I as the most satisfactory and economical design for its suburban service, which consists of short runs (11 miles) and frequent stops. New engines of this design would doubtless have some improvements in detail, such as wide fire-boxes and piston valves; inside admission. Also the coal and water spaces would probably be increased, which might possibly necessitate a four-wheel truck, reducing somewhat the favorable ratio of adhesive to total weight.

Metal Ties in Germany.*

A portion of Herr Haarmann's valuable work on railroad structure is devoted to a description of metal ties on the Georgs-Marien-Hutten Railroad, which connects Hasbergen station on the Köln-Hamburg line with the station Oesede on the Osnabrück-Brackwede line. This is in certain senses a mountain railroad, as there are numerous grades on it reaching 1°/₁₀ per cent., and curves with radii of 1233.656 ft. It is worked as a single track line, and between the stations Holthausen and Georgs-Marien-Hutten there is a daily traffic of 30 trains; six passenger, 14 freight and 10 mixed, in which are hauled daily 46 passenger cars and 438 freight cars, with a total loading, in round numbers, of 3,000 tons. The wheel load of the two-axled, tender-locomotives is 7.5 t. The speed is not above 28 miles per hour.

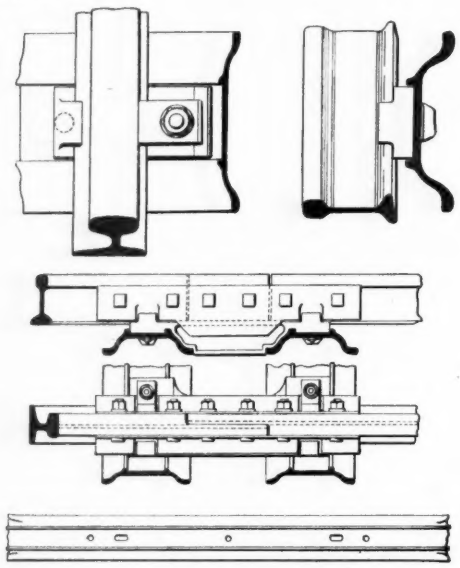
Since the Georgs-Marien-Bergwerks-&-Hutten-Verein makes a specialty of the manufacture of railroad superstructure, the busiest portion of this line serves it for practical experiments with main line superstructure systems, and, usually, such experiments have also been made on lines with fast train service so as to admit of simultaneous observations.

The entire piece of experimental track has been divided

*Extract from *Das Eisenbahngleis*, by A. Haarmann; Leipzig, 1902.

into several trial sections, and for years has been subjected to monthly measurements of width of rail head, surface, gage, line, drainage and abrasion of material, and such measurements have been regularly recorded. These statistics give a practical basis for the reliable judgment of the behavior of the various track and rail joint constructions.

The form of the iron ties differs from those heretofore used. Most of the well-known designs of iron ties have not proven entirely practicable, because the distance between the running surface of the rails and the bearing surface of the ties, when compared with wooden ties, has been too small; because their hollow and sharply angular form has prevented proper tamping and bedding, and also because the perforation of the ties for the purpose of receiving the rail fastenings has weakened the fibers of the upper half, which are subjected to the greatest stresses.



Metal Ties and "Strong Construction" Joints, Hasbergen-Osnabrueck Line, 1900.

The rib ties used with the strong-joint superstructure have in the first place a greater weight, 55.22 lbs. per meter; a wider bearing surface, 10.63 in., and extend to the bottom edges, without sharp corners and angles, in the direction of the action of the tamping hoe. The surface of the tie, by means of which the pressure is chiefly transmitted to the bedding, is elevated above the bottom edges merely enough to give the necessary rigidity. To avoid injuring the upper and most severely used fibers, which invariably occurs with iron ties with entirely flat surfaces, because of the perforations which it is necessary to make in them, the upper part of the profile has been bounded by two longitudinal ribs.

These two ribs also serve to entirely prevent displacement in the direction of the traffic of the gage plates which are placed between them. Lateral displacement is prevented by means of bolts passing through the deck of the tie. The friction of the parts against each other, and the consequent cutting of the face of the tie is obviated by these means. The gage plate, with sloping top, is of such thickness as to permit of a lower position of the tie bearing surface in the ballast, such deeper location having been found advantageous in the wooden tie superstructure. The holes for the reception of the rail fastenings are bored, because punching produces minute fractures which gradually enlarge and generally lead to breaks, although such breaks may not occur for years.

The ties are 2.77 in. high and .354 in. thick. The weight of a tie 8.86 ft. long is 160.16 lbs., including the end closing.

The resisting power of the "alternate-web-lap-joint," using splices 31.50 in. long, with six bolts .878 in. in diameter, and nuts, against vertical bending, is equal to bending resistance of the rail between the joints.

In view of the fact that plates and bolts are an imperfect substitute for molecular connection between the rails, it was deemed necessary to provide further protection against the bending, sinking and shearing movements of the lap ends. For this reason a heavy carrier is inserted between the joint ties under each rail, such carrier supporting the joint for its entire length and serving to distribute the load to both ties in such a way that the joint, because of the complete framing of the ties, possesses all the good qualities of the supported joint without sacrificing any of the advantages of the suspended joint.

The carrier is so formed that the ends, which rest upon the ties, are utilized for fastening the rails to the joint ties, in the same manner as the plates on the intermediate ties. The claw plates and the hook bolts are similar in both instances. The fact that the form of the carrier conforms to that of the rail base, of the ties and the splice bars facilitates its use; without any change of the remaining parts of the joint, such a carrier can be used in place of two gage plates at any joint.

Finally, relief of the joint apparatus, from the entire task of preventing the creeping of rails, has been brought about by the application of gage chairs, in place of gage plates, on various intermediate ties. These gage chairs differ from the gage plates only in the addition of an outside flange, which is placed against the web of the rail, and is attached to it by means of a bolt. The flange of the gage chair has a further advantage in that it effectually resists the tipping tendency of the rails, so that it is very useful, particularly on curves, and it also serves to preserve proper gage.

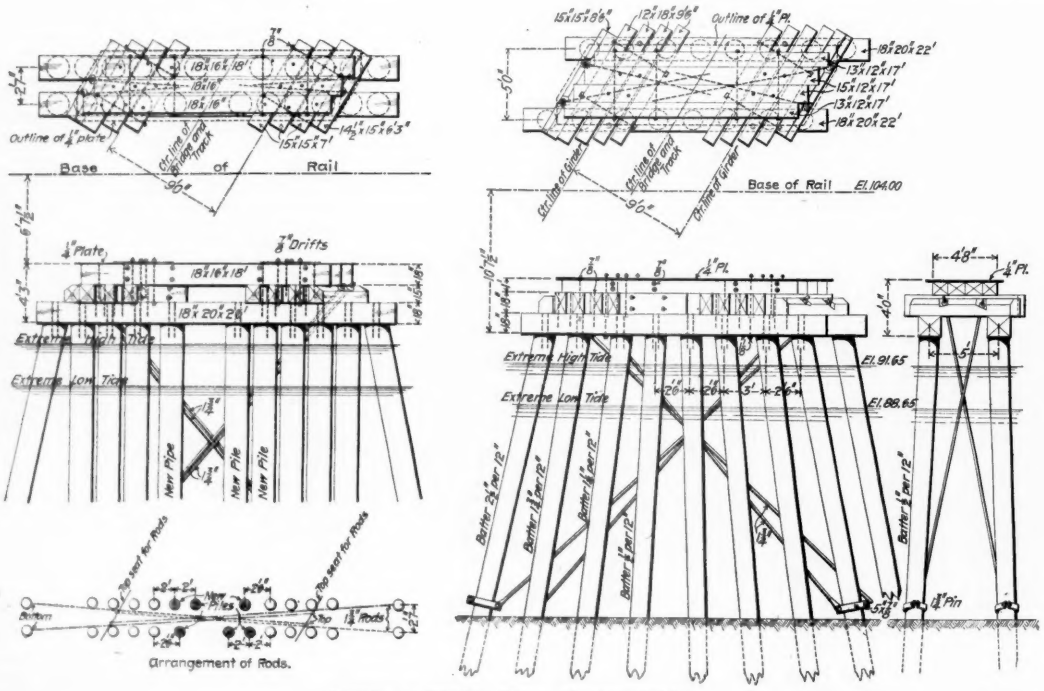
Nineteen ties are applied to each 49.215 ft: of track. At the joint the distance from center to center of the ties is 19.685 in.; near the joint, 27.303 in., and for the remainder, 32.283 in. The entire bearing surface of the track is 9.94 sq. ft. per meter. If, in accordance with the latest order of the Prussian State Railways, 20 ties were used, the bearing surface would be 10.74 sq. ft. per meter. The track is placed in stone ballast 11.81 in. deep. For experimental purposes, smaller waste material was used for tamping.

In contrast with the older forms of iron ties, which cut into the roadbed at a greater or lesser depth and angle and thereby enhance the difficulty of tamping, the new form lends itself as readily to tamping as the wooden tie.

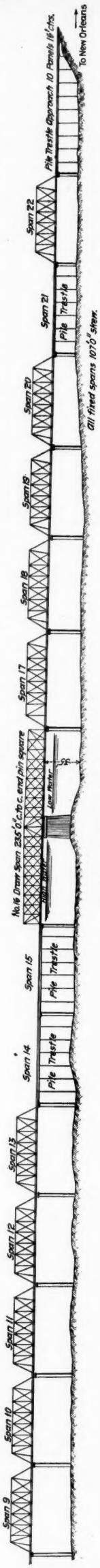
The Rigolets Bridge.

Between the towns of Bay St. Louis and Pass Christian, Miss., there is an outlet of the St. Louis Bay, connecting that body of water with Mississippi Sound. The outlet, known as the Rigolets Pass, is approximately two miles wide, and is crossed by the New Orleans-Mobile line of the Louisville & Nashville. The present bridge and trestle is about 25 years old, and is being replaced with girder spans and a draw taken from another division and strengthened. The structure is interesting on account of its length, and the use of creosoted timber piers. A large number of the creosoted piles which will support the new superstructure were driven 27 years ago, and are still well preserved, both from rot and from the teredo, which are plentiful in these waters.

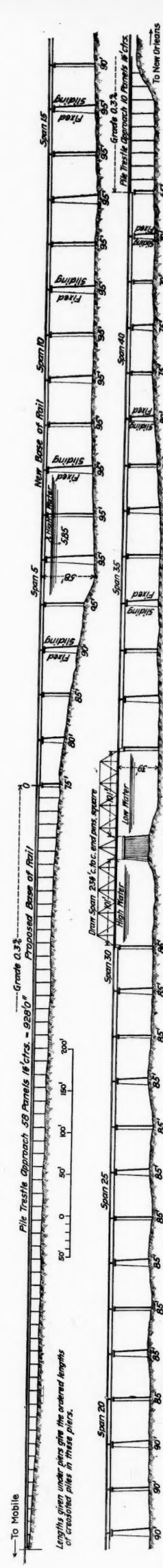
The present superstructure consists of 13 truss spans,



Details of Timber Piers, Rigolets Bridge.


To New Orleans
Pile Trestle Approach 10 Panels 16' ctrs.
All fixed spans 107'6" skew.
To Mobile
Grade 0.3%
Proposed Base of Rail
Lengths given under piers give the ordered lengths of creosoted piles in those piers.

Portion of Old Bridge, Rigolets Pass.



New Rigolets Bridge.

107 ft. each; one draw span, 235 ft. long, and five trestle spans, each 107 ft. In addition, there is a 58-panel pile trestle approach at the Mobile end of the crossing, 928 ft. long, and a 10-panel approach at the New Orleans end, 160 ft. long, exclusive of earthwork. A characteristic portion, comprising about half of the old bridge, is shown in the illustration. The new structure will consist of 42 53-ft. plate girder spans on timber piers, with a 236 ft. draw span, and the former approaches. New pile piers were driven between the old ones, and piles in the old piers were made use of to support the other ends of the plate girders. Figures under piers indicate length of piles ordered. There is no concrete or masonry in the structure, but creosoted yellow pine is used throughout. The accompanying profile shows the entire length of the new bridge, and details of the structure of the piers are also shown. We are indebted to R. Montfort, Chief Engineer, for the drawings.

The Third Rail for High Speed Electric Service.*

It is only recently that any marked movement (among electric roads) has occurred towards closer identification with steam railroad practice. The largest majority of interurbans continue to use the trolley and overhead system of feeders in order to supply power to cars. This is only natural in view of the excellent service the trolley has given for so many years in urban and suburban practice. There are new conditions which present themselves, however, when the trolley is used to supply power to cars or trains drawing from 500 to 1,000 amperes, and at a speed of 40 to 60 miles per hour. The contact area of a single trolley is but very small, while it is amply sufficient for the demands of the ordinary street cars; its behavior under interurban conditions can best be studied by watching one of these cars at night in the open country, and when it is running at its maximum speed. Under such conditions serious arcing occurs at the point of contact of trolley wheel and wire; the color of the flame is a greenish white, indicating burning copper and the size of the arc is proportional to the amount of current taken. Trolley wheels are worn out at the rate of one every three to five days; even the best do not last over one week. The trolley wire is rapidly worn and soon breaks at the weak spots. Experience shows that the trolley wire wears most on grades and curves, wherever cars take a large amount of current. Unfortunately, no data is available from which the total maintenance cost per mile of overhead trolley may be obtained for interurban work, and which includes the cost of renewal of trolley wires. That this depreciation is a very high figure, is generally admitted, as is also the fact that maintenance figures obtained in urban work are not applicable for interurban calculations. There is in addition to the high operating cost of trolley wires and wheels, a serious chance for trouble when the trolley leaves the wire at high speed, in which case not only the trolley pole becomes useless, but more often the pipe brackets carrying the wires are ripped off the poles for a considerable distance, and sometimes the car roof is damaged. All these limitations have no bearing when cars are operated at comparatively low speed.

The third rail method of operation is particularly suited to meet these objections and provide a satisfactory and inexpensive current supply for cars running at high speed, although originally it was not designed for such work. Its first use was on the intramural railroad at the World's Fair in 1893. From that beginning it soon was adopted for use on the Chicago elevated lines. These roads adopted the third rail with a view of avoiding the unsightliness of overhead wires on an elevated structure rather than on account of any specific advantages in the supply circuit. The first application of the third rail on a surface railroad was on the Nantasket Beach branch of the New York, New Haven & Hartford. In view of the extreme conservativeness of steam railroads on the subject of electric traction, it is interesting to note that we owe the application of the third rail to surface work to one of their number. After the original installation at Nantasket, the same steam road equipped several of its branch lines in Connecticut with this system. The next and the first strictly electric line to install a third rail surface system was the Albany & Hudson; then follows the Grand Rapids, Grand Haven & Muskegon, and the last and most prominent to go into service is the Aurora, Elgin & Chicago. At present there are a large number of projects planned and building, using the third rail system.

The trolley is and always will be the most suitable of the two methods for electric lines largely on streets and highways, or with right-of-way located adjacent to and parallel with a highway. Whenever a considerable portion of the roadbed is private right-of-way, however, and not located too closely to the highway, the third rail becomes advisable from the dollar and cents standpoint as well as from purely engineering causes, and for cars taking considerable amount of current at relatively high speed is really the only satisfactory method.

CONSTRUCTION DETAILS.

The present practice is to locate the third rail at one side of the track. The distance from gage line of track rail to center line of third rail is usually about 20 in. in elevated practice and about 27 in. in surface work. The elevated standard is one much to be commended for surface work, for in addition to the ability to interchange cars with the elevated, it gives an extreme width over the third rail shoes which is no more than the width of the car itself, and thus avoids lifting mechanisms and similar devices intended to protect the shoe when car is in city streets and using the trolley. The perpendicular distance from top of track rail to top of third rail is now generally about 6 in., which is a convenient height for allowing ample space for insulators under the third rail.

The location of the third rail at one side of the track necessitates ties for supporting this rail which must necessarily be longer than the standard track tie. In elevated service insulators are usually placed 5 to 6 ft. apart, while in surface work a distance of 10 ft. between insulators has become standard, and with the size of rail in use and the absence of vibration present in the elevated structure, this standard is liable to remain. For insulators spaced 10 ft. apart, and a standard tie spacing of 2 ft. between centers, every fifth tie must have an extra length, or be approximately 9 ft. long, in order to accommodate the insulator. On roads using all hardwood ties, these extra long ties may be of the same material as the balance, but when cedar ties are used it is usually considered better practice to make the third rail tie of some hardwood, like oak or chestnut.

In order to insulate the live rail, the early third rail systems all used wooden blocks and their use is continued on some roads now building. For elevated service these blocks will serve fairly well, especially when they have been dipped in some insulating compound. There is perfect drainage of the structure, and water cannot possibly accumulate on elevated tracks. It is nevertheless noticeable that the most recent installations of elevated railroads, the Boston and New York roads, have not used wood at all. Briefly, the objections to wood are that it absorbs water and allows a heavy leakage which many times destroys the insulator. When new, and in dry weather, it forms a very excellent insulator, but a surface roadbed cannot have the perfect drainage of an elevated structure, and the water will accumulate and be absorbed. As an example may be mentioned the Albany & Hudson Railroad. Its third rail is supported and insulated by wooden blocks dipped in insulating compound, and fastened to ties by lag screws. For several months after its installation, the insulation resistance of the third rail was very high and the situation looked very favorable. Trouble with the wooden insulators did not appear until the following spring, when snow which had been packed around the insulators and rail for several weeks without the least interference to service, began to gradually melt and this caused ties and insulators to become completely permeated with moisture and introduced a serious leakage. In several instances insulators were found burning, and a peculiar characteristic of that was that they were almost invariably burned in the center, while the outside remained intact, thus indicating clearly that the water had been absorbed by capillary attraction from the tie. The wood insulators on the Aurora, Elgin & Chicago have hardly been in use long enough to permit conclusions to be drawn, but indications are that they will be found to have a very low insulation resistance and, in fact, quite a number of burned ones have already been found and replaced. It would seem from the above that a higher standard of insulation should be demanded, and there is no reason why the same standard demanded for overhead construction should not be reached in third rail work.

The conductor rail is usually of a standard T rail cross-section, but is rolled from a grade of steel containing a very small amount of carbon and manganese. For a resistance in the conductor rail of 7.5 times that of copper of equal cross-section, the steel companies supply a rail containing about .12 of 1 per cent. of carbon, and .14 to .15 of 1 per cent. of manganese. The standard mixtures used in rolling service rails for steam and electric railroads contain very much higher percentages of both carbon and manganese, and their conductivity is usually about $^1/_{12}$ that of copper of equal cross-section. It is therefore apparent that the value of steel rails for use as electrical conductors depends not so much on the price per ton as on the conductivity. As a general rule it may be stated that old rails sold as relayers will usually net enough cash to buy the low carbon rail of equal conductivity, and leave a cash balance besides.

One of the small details which has proved important on high speed third rail roads is that of joint plates. The early roads and the elevated roads both used a plain strap to connect rail ends. The aligning is comparatively unimportant at low speeds, but at a high speed a slight unevenness will cause the shoe to jump and cause a disagreeable flash, and to avoid this the rail ends must be carefully and rigidly aligned and the "burr" taken off the two adjacent edges with a file. The Manhattan type of joint plate was adopted on the Aurora, Elgin & Chicago, and is giving very satisfactory service.

It may be mentioned in passing that all third rails when new cause some sparking at the shoes, and it requires several months of operation to wear down the rail to a smooth surface, giving a good contact without sparking. It is during these first few months, however, when visitors with a critical eye are most numerous, and thus many people have the impression that this sparking is a regular feature of the third rail operation.

In place of the joint rails and bonds, it is possible to use a cast welded joint, which might have advantages for this class of work, but it cannot be expected to exceed the convenience and efficiency of the foot bonds hydraulically pressed in place which have become almost universal for this kind of work. The convenience of applying these bonds, the absolutely perfect contact they make when in place and the flexibility they give in handling the rail in case work has to be done or changed after it has gone into service, make them the almost universal choice for this work.

Expansion and contraction of the third rail is not as serious a matter as in the service rail. A joint spacing similar to standard track rail spacing is usually used, but the writer's experience leads him to recommend a close butting of the joints, leaving no space whatever and drawing the joint plate tight, regardless of any chance for movement due to expansion or contraction. The rail may then be rigidly anchored midway between two highway crossings. In this way the extreme movements of the rail end may go as high as 12 to 15 in., but since it occurs at crossings where the rail is naturally terminated it is of no consequence.

The highway crossings are an important part of the third rail installation. The current must be carried from rail end to rail end with the least expense and a minimum risk of failure. The most ideal way would be to provide standard underground single ducts, and drawn in cables, but this is expensive. The cable used should have the same conductivity as the rail, and in most cases is of about 1,000,000 C M. size. This is a large and expensive cable costing over $1 per lineal foot when installed and exceedingly expensive to replace should it fail, especially when the renewal has to come out of the operating costs. Engineers who have had experience in operating underground cables for railroad and power supply in large cities realize the difficulties which are met in installations of that sort, although their cables rarely terminate out of doors close to the ground and exposed to water and mechanical shocks. All of the latter conditions have to be met in third rail crossing cables, and in addition the latter must be capable of withstanding the excessive overloads liable to occur in railroad work and should therefore have a paper insulation in preference to rubber, to prevent overheating and melting the rubber.

If one is satisfied with low insulation, it is very easy to purchase ordinary triple braid weather-proof cable and install it buried in a trough filled with pitch and tar. This method is cheap but its durability and insulating quality is as yet uncertain. Paper cables, lead covered, would seem to be most advisable and if properly installed should not give much trouble, although it is well to bestow on these cables the same care and attention which the large operating companies give their underground feeders. Periodical insulation readings carefully recorded should be made and as soon as any cable gives signs of weak insulation the cause must be ascertained and remedied. The terminals of each cable must be arranged so that there is no possibility of any current leaking to the lead sheath even in the wettest weather. In order to further guard against this possibility a small copper wire should be *soldered* by a lug to the lead sheath and the other end of the wire connected to one of the track rails. It is also of the greatest importance to be able to disconnect conveniently and rapidly each cable from the rail for the purpose of testing and reading cable and rail insulation, locating short circuits, etc. In order to prevent the contraction and expansion of the rail from doing mechanical injury to the cable, it is good practice to make the connection between the two by three or four extra flexible pieces of cable about 20 in. long, one end of them bonded to rail, the other end sweated into a convenient lug which is attached to the cable terminal by a screw.

When cars pass over highway crossings which have a distance from rail end to rail end longer than the distance between third rail shoe the car lights will be momentarily extinguished, and this has been the cause of much annoyance to passengers. To remedy this fault seems to be a problem which comes under the heading of car equipments rather than third rail, and will not therefore be discussed here.

The third rail shoes carried by the car are within the scope of this paper, however, and may be briefly referred to. The shoes weigh from 14 to 18 lbs. each and are supported by two cast links which allow some freedom of movement to the shoes. There is no force holding the shoe on rail except its own gravity. The shoes are usually supplied with a perfectly flat and chilled wearing surface. When making renewals of shoes it has been the practice of the writer to have this surface cast concaved with a radius of 12 in., which is the radius given to the top of steel rails. In this way a very much larger contact area is secured and sparking is reduced to a minimum from the start. Instead of a cast-iron shoe with chilled surface a mild steel shoe has been found very much superior. The life of shoes is as yet uncertain, and there are no records in existence, to the knowledge of the writer, which give accurately an extended record of the mileage of third rail shoes. General observation by the writer leads him to believe that the average life of a shoe lies somewhere between 15,000 and 25,000 car miles, and as the cost per shoe and pair of links is about $1.35, this cost of renewal is exceedingly low and not to be compared with trolley wheel renewals. At present all roads are equipped with third rail shoes which depend on gravity for contact with the rail, though the Boston Elevated supplements this by a long coil single turn spring giving about 15 lbs. additional pressure, and the officials of that road are very well satisfied with this arrangement. Lately, Mr. W. B. Potter, of the General Electric Company, has designed a shoe which is worked by springs and which will at once appeal to practical men. As put on the

*Extract from a paper read before the Western Society of Engineers, March 18, 1903, by Ernest Gonzebach, M. W. S. E.

market it is designed to extend out horizontally and make contact with rail under a covering, also designed by Mr. Potter. Whatever the merits of this protected third rail may be, it is certain that the shoe designed for it, or a modification of it, would meet all the objectionable features of the present form of gravity shoe.

The merit of a covering for the third rail seems to be open to question. The covered third rail as designed by Mr. Potter should avoid difficulty from sleet, but it remains to be proven if such a covering would be suitable in open cross country work where snow is liable to drift and be packed tightly between the rail and the covering. It might prove more difficult to dislodge the snow from such a location than it is to get rid of sleet, which, with present methods, is probably the most serious of all objections to third rail operation. Sleet cutting devices in innumerable forms have been tried; few of them have been very successful. The steel scrapers in use on most of the Chicago Elevated roads seem to be the most successful so far. The New York Elevated uses steel brushes worked by air pressure, while the Boston Elevated has been remarkably successful in the use of a steel brush held against the rail by a spring giving a total pressure of about 35 lbs. This is just the amount of pressure required to press the particular style of brush used against the rail without bending the individual wires composing the brush from a vertical position. The Albany & Hudson tried innumerable devices and the most successful seem to be a modification of the Chicago scraper held against the rail with a very heavy pressure. The Aurora, Elgin & Chicago has been using salt with success, supplemented by steel brushes. The writer confidently believes that the use of brine judiciously distributed just ahead of a steel brush of the Boston Elevated type will eventually be found to be most useful, and that in a very short time we will have learned to meet the sleet problem and have permanently disposed of it.

Choosing the size of the third rail for an interurban high speed railroad, corresponds to designing the distributing system of an ordinary electric railroad. When there are auxiliary feeders of either copper or steel the size of the working conductor is comparatively unimportant, but when it forms the sole feeder as it does on most surface systems, then it must be carefully chosen. As a rule high speed lines of the kind we are using for examples are too long to make a direct current station advisable and they are therefore designed to generate alternating current delivered to rails through rotary converter stations. The number and location of these sub-stations will affect the size of the third rail, and there seems at present to be a tendency to use fewer sub-stations and heavier rail. In the writer's opinion this practice is erroneous, although when sub-station attendance is high, it may *apparently* be the least expensive. Unfortunately, a practice has grown up of making sub-stations little miniature power-stations and providing in them all sorts of engineering freaks in the way of apparatus. Such a station requires skilled attendants, and even when there are only two shifts, the wages form the largest item of sub-station expense. Again, sub-stations are often located by the manufacturer of the electrical apparatus, who places them so as to get the most ideal power distribution, and quite regardless of any other useful purpose they might conveniently serve. Sub-station location is a subject beyond the scope of this paper, but it may be remarked in passing that if sub-stations were located more numerously and judiciously and more simply designed, they might serve a most useful purpose as passenger, express and freight depots, as distributing centers for power and lighting supply and other by-products of an electrical plant, and their attendance would become a small part of the expense chargeable to motive power. In fact, there seems to be no reason why they should not become sources of income instead of being a dead weight on operating expenses. With attendance eliminated, the size of rail can be very closely determined by comparing the interest and depreciation of the third rail and track circuit with that of the sub-stations. If the track rails are a fixed size, then the size of the third rail to be chosen will be found when its interest and depreciation very closely equals the sub-stations. Practically, however, the sub-stations should be located as near the heart of towns and villages as possible, and third rail determined afterward.

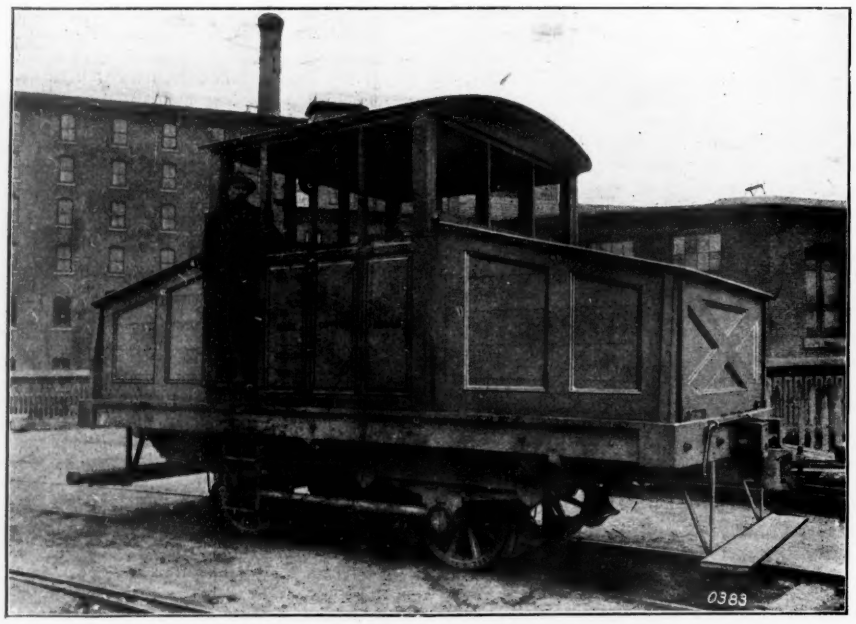
The third rail and a judicious arrangement of the alternating current feeder system will serve as the most convenient power supply for long high speed lines for many years to come, and the strictly single or multiphase railroad using high tension current on the car will have difficulty to show advantages over a properly designed and operated third rail current railroad system.

In the discussion which followed Mr. Gonzenbach's paper, the chief objections raised were directed against the use of brine to remove sleet, on the grounds that brine was very corrosive; that it coated the insulation and caused leakage, etc. Mr. Gonzenbach said in reply that its use had not been extensive, and he offered it chiefly as a suggestion.

A Twenty-Ton Storage Battery Locomotive.

The locomotive shown herewith has recently been built for the works of the Massachusetts Cotton Mills in Lowell, Mass., by the C. W. Hunt Company, New York. The freight siding is separated from one of the two principal storehouses by the main business street of the city, and from the second of these storehouses by the canal which supplies the turbines of the mill. It is necessary to deliver carloads of baled cotton at either or both of these buildings. Neither a steam nor a trolley electric locomotive is permissible in the storerooms on account of the fire risk.

The locomotive is built for the standard 4 ft. 8½ in. gage, and is fitted with M. C. B. standard couplings, making it suitable for use with any ordinary railroad car, and on any standard railroad track. The length over the bumpers is 21 ft. 4 in., and the height from the railhead to the top of the cab is 12 ft. 1 in. The wheel base is 7 ft. 6 in. The weight is about 20 tons, and runs at a speed of from two to four miles an hour on level track.



Twenty-Ton Electric Storage Battery Locomotive.

The locomotive is "double ended," the cab being in the center. This makes a desirable arrangement for switching work, which calls for operation in both directions with equal facility. The batteries are contained in the sloping compartments at each end. The wheels and axles are driven from the gear cases in the cab by means of Renold silent chains suitably enclosed. These chains are the only portions of the driving gear below the car body, the motors and gear cases being mounted in the cab and are readily accessible.

The battery was furnished by the Electric Storage Battery Company, the elements being mounted in tanks of extra depth to prevent the electrolyte from splashing over the top. Two motors, specially wound, are used and may be connected in series or parallel, and by varying the arrangement of the fields, an efficient speed control is obtained without wasting any of the energy of the battery by passing it through a resistance.

The controller is the standard vehicle type, and has two levers. These levers are mechanically interlocked, as in the case of a trolley car controller, so that the motors can only be reversed when the speed lever is in the off position. The locomotive may be run with the controller in any notch, there being no transition point on which a careless operator might leave his lever and burn out the apparatus.

All the gears are machine cut, and run in a bath of oil. There is a separate gear case for each motor, and the driving gear consists of two parts which are exact duplicates. In an emergency, one motor could be cut out entirely, and the locomotive operated by the remaining motor, but with a reduced hauling capacity.

The driving axles are the M. C. B. standard and run in "Hunt" patent roller bearings. Experience has shown that in light switching service, the batteries can be recharged at various times during the day while the locomotive is waiting between hauls. For heavier service, it may be necessary to charge during the noon hour or after working hours in the evening.

Notes From Mount Claire.

The Mount Claire shops of the Baltimore & Ohio, at Baltimore, labor under the disadvantages of age and the fact that the requirements of the road have outgrown their original capacity. These conditions have been met, however, by the introduction of many modern tools and within the past two years a large and well appointed machine shop has been built. The shops are electric driven, but owing to the fact that most of the tools have been in use for some time and are not adapted to the individual drive, the group system is used. The motors are arranged to drive the line shafting in sections, and the overhead arrangement differs but little in appearance from the ordinary shop with a steam driven line shaft. These sections of shafting may, however, be run independently or coupled together, according to the requirements of the service.

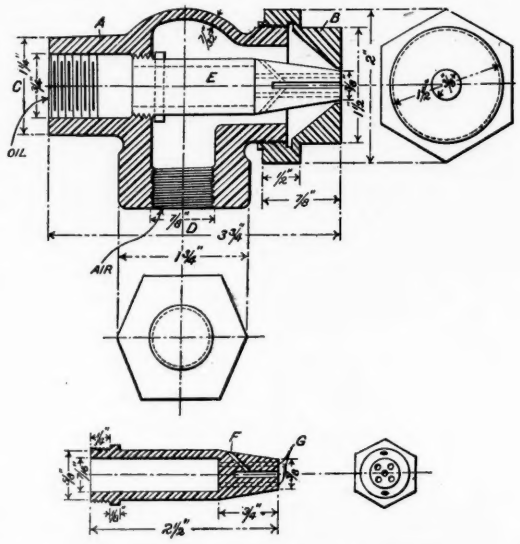


Fig. 1.—Oil Burner for Welding Frames.

Outside of the machine shop and next to the repair yard is a small shop recently built for repairing steel cars. It contains a medium size oil furnace for heating plates and bars, a strong pair of shears and a flanging table. The cars are run in on an adjacent track and the damaged parts taken to the shop. If straightening alone will be insufficient, patches are fitted and riveted in place. Of course, work done in this way is not as smooth as the repairs to wooden cars, but the strength of the original structure is maintained and there seems to be no difficulty in doing this class of work on pressed steel or structural steel cars.

Broken locomotive frames are welded as follows: The frame is jacked apart at the point of the break and a piece of iron ¾ in. thick slipped into the opening. Care is taken that the grain of this piece runs in the same direction as that in the frame, and it is allowed to project about ½ in. beyond the frame on all four sides. A heavy bolt is then fastened to the cylinder and run to a point on the frame back of where the weld is to be made. A sheet metal casing made in two halves and lined with fire-brick is set down over the frame and bolted together. This encloses a length of about 12 in. of the frame in a furnace having a space of approximately 5 in. between the metal and the fire-brick. Two peep-holes are provided through which the progress of the heating can be watched.

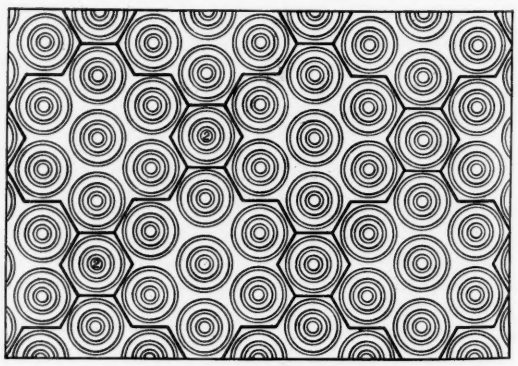


Fig. 2.—Foundry Floor—Mount Claire Shops of the Baltimore & Ohio.

An oil burner is used for heating and this is fed with crude oil flowing by gravity from a can set on the running board and is atomized by air at 80 lbs. per sq. in. When the frame and the filling piece at the point of the weld have been heated to a white heat, the oil and air blast are shut off and the casing forming the furnace knocked apart. The nut of the long bolt, previously referred to, is then tightened, drawing the parts of the weld together, and this is continued until the frame trams $^{5}/_{16}$ in. more than the proper normal distance between two points that had been established before the heating was begun. The projecting portion of the filling piece is then hammered down and the faces of the frame trimmed smooth and flush. When cool the bar will have

shrunk back to its original length. The saving by doing the work in this way is very evident and the method will probably be extensively used in the future. A somewhat similar method was described in the *Railroad Gazette* Feb. 27, last, in connection with an article on the Albany shops of the New York Central. Work of a similar character has also been done at the shops of the Southern Pacific since November, 1899, where the method used is as follows:

The engine is stripped at the point of the break and a temporary furnace is built up. This furnace is supported upon a sheet of iron or steel so that it can be quickly dropped out of the way when a welding heat has been reached. This, however, is not done in practice until the first or setting up blows have been delivered. Where the break is in one of the jaws of the pedestal a pneumatic hammer weighing about 35 lbs. is used, while if the break is in the top rail a 1,000 lb. ram is used, with the furnace still in place. Before the heat is started the two parts are jacked open and a piece of end grain iron inserted which is, in this case, allowed to project about ¾ in., and is, of course, chipped off flush with the frame when the weld has been finished.

Oil is used as a fuel, kerosene or some of the lighter distillates being preferred. Crude oil of 23 deg. gravity may also be successfully used. It has been found necessary to use great care in adjusting the burner to insure delivery of the proper proportion of oil and air. The distance of the burner from the metal must be such that the latter will be uniformly heated and the outside not melted before the interior is brought to welding temperature. The position of the brick in the furnace has also been found to have an important influence upon the final result.

If reports be true as to the work that has been done with the new combination of aluminum and the oxide of iron, discovered by Dr. H. Goldschmitt and used in Germany, it would seem to be specially adapted to the welding of locomotive frames in place. This new substance, which is called "Thermit," is capable of developing intense local heat, and has all the properties of a very mild steel. It has been successfully used in welding the rudder quadrant arm of a steamship, and also a cracked 13¾ in. crank shaft; both in place. To apply it to the welding of a locomotive frame it would be necessary to cut out a piece, which could readily be done with a portable power saw, and then pour the thermit metal into a mould formed about the opening.

The burner used at the Baltimore shops for welding frames and heating plates is shown in Fig. 1. The two openings, C and D, are for the admission of oil and air respectively, while the third opening is capped by the delivery nozzle B. The oil nozzle E is screwed into the back of the opening at C. It is ⅝ in. in diameter and has a hole $^{7}/_{16}$ in. in diameter extending a little more than two-thirds its length. From the bottom of this hole are four small holes about $^{3}/_{64}$ in. in diameter, marked G, for the delivery of the oil to the furnace. Air enters at B and is blown out at the nozzle in the annular space about $^{1}/_{32}$ in. wide encircling the oil tip E. It also enters the small hole F and issues through the central hole in the oil nozzle, which is about $^{5}/_{64}$ in. in diameter. The oil as it enters the furnace is instantly atomized by two jets of air, the one surrounding it like a ring and the other being a core within it. The result is a flame of high temperature.

A novel type of floor is used in the Mount Claire foundry. It is shown in plan in the accompanying illustration, Fig. 2, and is made of plates of cast-iron about ⅝ in. thick. This peculiar shape interlocks the several pieces more securely than could be done with simple hexagons, but requires a line of small filling pieces as noted at 2, 2. The upper surface is roughened with circular grooves. These plates are laid upon a bed of sand previously rammed.

Among the more recent developments is a floor turntable, many of which are in use in the machine shop. This is shown in Fig. 3. The foundation for the pit, center plate and circumferential rollers is cast-iron, into which a steel ring is sunk at the top to carry the balls. The table is cast-iron with a corresponding steel ring. The bearing has 16-1¼ in. balls and 16-1⅛ in. balls. The table as recently constructed has but one cross groove instead of the two shown, as the edges of the track were being battered down by the wheels of loaded cars. The upper surface of the table is cut into diamonds to prevent slipping, and the outer edge is carried by six roller wheels having a convex periphery. The table is cast in four pieces and is bolted together. The cap for the wall is in eight pieces held down to the wood by bolts with the nuts countersunk into the upper surface.

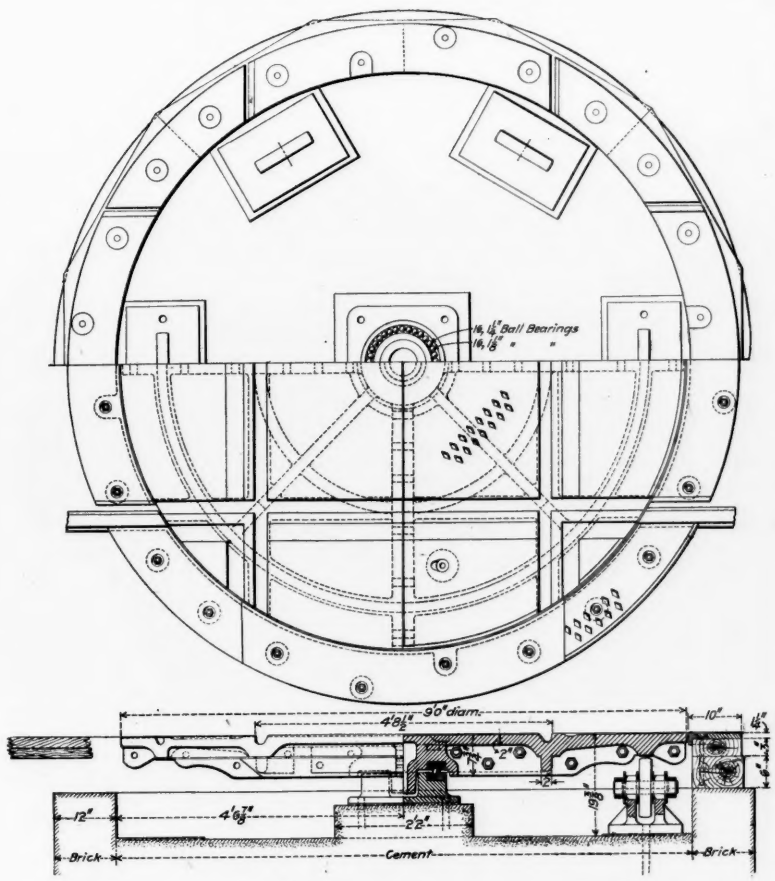


Fig. 3.—Turn-Table in Machine Shop—Mount Claire Shops.

Double Pay on Double-Header Trains.

On the Great Northern road, representatives of the conductors and trainmen met on March 10 the General Manager, Mr. F. E. Ward, and asked for an increase in pay and also a consideration of the following proposition: "On double-header trains either of the following propositions will be satisfactory: Trains of more than 30 cars, exclusive of caboose, when handled by more than one engine, will be paid double rates for miles and hours made, or: The practice of running trains of more than 30 cars, exclusive of caboose, handled by more than one engine, will be discontinued."

All the increases asked for the passenger and freight conductors, baggagemen, brakemen and yardmen were promptly granted, to date back to March 1, provided that the double-heading claim was withdrawn. Mr. Ward offered to submit this proposition to a vote of the Great Northern's conductors and trainmen, but this was, for the time, prevented by the officers of the national brotherhoods, who wanted to deal with the Northern Pacific before making a settlement with the Great Northern. The committees' negotiations with the general manager have extended over nearly two months. The stenographic reports and the correspondence make a mass of material in which some good things are buried:

By Mr. Ward: "Admitting, as I believe you do, that there is no question between us but that of pay for double-header trains or the alternative of agreeing to abandon their use, I cannot understand your unwillingness or inability to give me reasons why you consider the services of a conductor or trainman worth twice as much on a train hauled by two engines as on a train hauled by one engine, or why as an alternative you should ask us to agree not to run double-headers."

By Mr. Garretson (of the National Order of Railroad Conductors): "The simple position that we take in regard to the double-header is this: When you take into consideration the fact that all over the country there is the tendency that there has been to increase the power of locomotives, there has likewise been a desire to utilize the lighter power—and lighter becomes comparative as you look at it from the present time back to the inception of the movement. When double-headers first came into use in a level country, the average engine was what was known as the standard, eight-wheel engine. It was a light engine which was equal to the pulling of the cars of that day on the basis of about a load to the inch. When the mogul engine, which was virtually the first departure after adding some weight on the eight-wheeler, came into use it handled possibly one-half or more than what the prior engine had handled. Then came the practice of doubling the lighter engines to handle as much tonnage or more tonnage as the heavier mill would get away with. . . . Now, I might just as well come to the root of the matter, because the real root is that while he recognizes the right of the company to limit the number of crews by large engines, in other words, the transporting ability of a given crew, if they get power large enough, he does not recognize the right of the company to limit the number of crews by making one crew handle a train hauled by two or more engines.

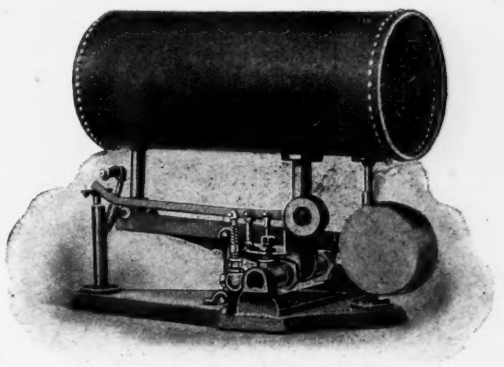
"The essence of this movement is to put on more crews. It will be just as tenable a position to say that when we limited the day to 10 hours—and it took a great deal longer to limit the day to 10 hours than in most other propositions—we were providing for the employment of more crews. When we limited the mileage made by freight trains or local trains and passenger trains, we had precisely the same thing. We made employment for more men."

By Mr. Ward: "But that wasn't the reason for reducing the hours from 12 to 10. It was a question of what the limit is of physical endurance and what a reasonable limit is." . . .

"The Great Northern's 1897 train mileage was 5,895,560, in which there was helper mileage, 311,928 (5.29 per cent.). In the nine months ending March 31, 1903, we had 6,198,819 train miles, and only 187,710 miles of helper-engines (3.03 per cent.). Showing that the very low percentage of helper mileage that existed in 1897 has been cut almost in two since that time, and therefore the question, so far as the Great Northern is concerned, is absolutely a dead one. . . . I do not claim that there is anything of consequence involved in the acceptance or refusal of your proposition so far as dollars and cents go now. But I do claim that you invoke a principle which will be of the most serious consequence to us, and that is your admission to consultation in the matter of what a train shall consist of. Granting your proposition there would be no possible reason why we should object to your coming in later and telling us that you object to carry any train of over 50 cars or 40 cars, or 30 cars, or any number of cars—if we admit this principle and admit you can tell us that we must not run double-headers. For that reason the question to us is of exceeding importance. We are the road above all others that in this country runs large trains. Our power is probably heavier on the average than that of any other road in the United States, and we have spent more money to lower grades so as to make it possible to haul big trains, realizing that the only true economy in railroad operation is in making that unit of a train the biggest thing we can make it; and you come in now with a principle that attacks our right to take advantage of the conditions we have created by buying large power and by spending money to lower grades—and that is a principle we will not admit."

Morehead Traps.

Since the Morehead trap was described in the *Railroad Gazette*, Oct. 31, some radical changes in its form and improvements in its construction have been made. A cast-iron base has been substituted for the wooden platform previously used. The drum, or tank, is now counter-balanced by a lever and weight having its fulcrum attached to the base. This is an improvement over the old movement, as the weight of the water has a greater leverage in starting the tilting of the tank, and the counter-



balancing weight has a more powerful leverage to bring the tank back to its normal condition when the water is discharged.

A slight change made in construction of the vent to the trap has overcome the necessity for the equalizing pipe which used to be on the outside of the drum, and an improvement has been made in the seat and disc of the steam valve, reducing the possibility of destruction and wear. The changes tend to improve the appearance of the trap, at the same time preserving the original simplicity of adjustments.

The trap as now made is shown in the accompanying illustration. Further information may be obtained from The American Blower Co., Detroit, Mich., or from any of their branch offices.

On the Putnam Division of the New York Central, during May, out of 862 main line trains three lost time. On the Yonkers branch of this division, which is equipped with Hall electro-gas signals, out of 2,456 trains two lost time.

A New Electric-Motor Signal.

Figures 1, 2, 3 and 4 illustrate the Pneumatic Signal Company's new electric-motor signal. The operating mechanism is outside of the line of the interior of the mast and therefore cannot be wet by drippings. It is inclosed in an iron case through which the mast extends down to a foundation of concrete; or, the mast can be fixed to the top of a double box in the usual form. Where this style is used the lower box is used for the battery. The apparatus is noticeable for its simplicity. It has few parts and the same machine is used for a one or two-arm signal, except as regards the arms on the shaft which connect to the vertical rods. A one-arm signal can be changed to a two-arm by simply adding an arm to the shaft and connecting it with the rod for the second signal arm.

Fig. 1. Electric Semaphore.

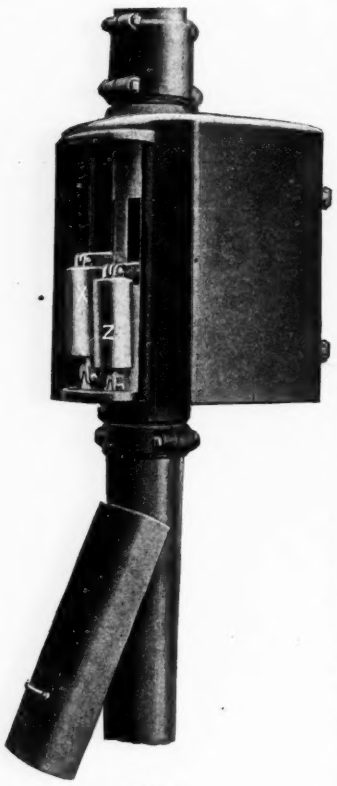


Fig. 4. Motor Box for Electric Semaphore.

The electric motor has a train of gear wheels, and a simple electrical control for making and breaking the connection between the motor and the blades.

The motor (shown at F, Fig. 3) is entirely inclosed, the commutator end having a glass shield; 680 revolutions of the motor are made to one of the main shaft T (Fig. 2). The power is transmitted through a train of gear wheels, W, W^1, etc.

The main shaft T is carried on roller bearings, and all other shafts have ball-bearings. The operating mechanism is placed in the case in such manner as to make it easily removable as a whole or in part, and is conveniently accessible from the front or rear.

The main shaft carries between the standards the home and distant signal levers H and D, respectively, which are free to revolve on the shaft. The driving lever or quadrant Q is fixed to the shaft. The vertical rods are attached to H and D at H^1 and D^1 respectively. The lever H carries a sliding dog G at H^2, which is fitted with rollers at each end. The driving quadrant is faced on the side next the lever H with hardened tool steel. The front of standard N is similar to H. The main shaft T is extended beyond the standard N and has attached to it a commutator to make and break the circuit.

The operation is as follows, all references being made to Figs. 2 and 3. The wheel W^5 forms part of the controlling apparatus, it being free to revolve on a boss, which forms part of wheel B. B carries an electro-magnet M, the armature lever L, crank lever A^1, and cam C. B has a square hole on its side into which the main shaft T fits, the two revolving together. The electro-magnet M is carried by the bracket K^1, which is secured to B. This bracket also supports the cranked lever L^1 and the cam C. Another bracket K^2, also attached to B, carries the armature lever L. On the shaft T^1, to which the armature lever L is fastened, there is also fixed an escapement jaw J. The armature lever L carries the armature A, this armature working on a pin A^1, which is free to adjust itself to the face of the magnet cores. When M is energized A holds K in the position shown; this through the escapement jaw J holds lever L^1 in the position shown; and the shorter arm of this lever will in turn hold the cam C. The cam itself is free to move about the center C^1 and engage with projections R R on the inner side of the rim of the wheel W^5.

When magnet M is energized and the motor circuit closed, the motor will rotate the wheel W^5 in the direction of the arrow; and, this wheel being engaged through the cam C and the levers L and L^1 with the part B, the main shaft T will also rotate, carrying with it the driving quadrant Q. The dog G not being free to slide to the right, will engage with the recess Q^1 in quadrant Q, and in consequence the home signal will be moved to the clear position. The projection Q^2 on quadrant Q will then engage with the distant signal lever D. Should the motor circuit remain closed, dog G will be forced to the right into the recess N^1 in the extension of the standard N, thereby holding the home signal at clear. The distant signal will in turn be moved to the clear position. When the magnet circuit is broken with the signal in the clear position, the levers L and L^1 are released; the longest arm of the lever L^1 will move upward until it strikes the stop P on B; this will allow the cam to be moved from its engagement with R until it strikes the stop P^1; and, the motor mechanism being in this way disconnected from the signals, the counterweights will cause them to return to the stop position, in the reverse order to that in which they are moved to the clear position; that is, the distant signal will move, first, and then the home signal. The force of the movements is checked by suitable dash-pots X and Z (Fig. 4).

To prevent the motor from being reversed by the counterweights, a pawl S engages with the teeth of the wheel W^1.

To facilitate the cleaning of the motor commutator and the setting of the brushes, a single clutch is provided on the motor shaft and the motor is so fixed that upon this clutch being released, it can be turned on the base so that the commutator end is to the front.

The American Creosote Works.

In our issue of January 23, page 65, we printed a short description of the works of the Southern Creosote Co. at Slidell, La. The American Creosote Works, which recently commenced business at Southport, La., is adding another cylinder to its plant at the present time, which will give it an annual capacity of 25 million feet B. M. for 24 hours' treatment, and will place it in the second place in the list of large plants in the United States. The Illinois Central has given the company the contract for its creosoted bridge work, and the standard specifications require this treatment for all bridge timber used on the line.

The American Works at Southport, just beyond the city limits of New Orleans, on the Mississippi River, occupies about 30 acres, which space is given up to storage yards, tracks and buildings immediately connected with the plant and the houses of the engineers and superintendent. With this space there is ample room for the storage of ties treated by any of the water processes, which is especially desirable in order that all the water may be evaporated, leaving only preserving salts and oils in the timber. As with the Southern works, the location is advantageous on account of its contiguity to the best portion of the pine belt of the South. The cylinder now in use is 110 ft. long and 9 ft. in diameter, built of flange steel of a thickness sufficient to give a working pressure of 175 lbs. to the square inch. This cylinder is said to be the heaviest in the United States. The process is the customary one, the timber being loaded on small iron cars and drawn into the cylinder; the cylinder doors are then closed and the timber is subjected to the action of live steam until there exists within the cylinder a pressure corresponding to the desired temperature. When sufficiently prolonged, the heat and inward force of the steam will gradually raise the inside temperature of the timber above the life point of bacteria, so that perfect sterilization is accomplished. While the germ life is being destroyed, the evaporation of the saps and moisture, and to some degree the softening of the resinous layers of the timber is also taking place. Great care is necessary to avoid overheating the timber, it being now well determined that temperatures over 300 deg. Fahr. have a very damaging effect upon the strength of the timber, which is due to resinous substances evaporating at about 305 deg. Fahr. and breaking down the structure of the wood. The company gives the following steam pressures and time for continuance (figures for freshly cut green timber):

Minimum section 3 in., steam for 8 hours, pressure 15 lbs., with temperature 250 deg. Fahr.

Minimum section 6 in., steam for 10 hours, pressure 20 lbs., with temperature 260 deg. Fahr.

Minimum section over 8 in., steam for 10 to 16 hours, pressure 40 lbs., with temperature 285 deg. Fahr.

For comparatively dry timber cut two months and over, the above hours for steaming may be reduced 25 per cent., although the same steam pressures should be used.

When the steaming period has been carried out properly, the pressure is removed and the cylinder freed from all accumulated moisture, leaving the timber in condition to be perfectly dried by the vacuum action which is then

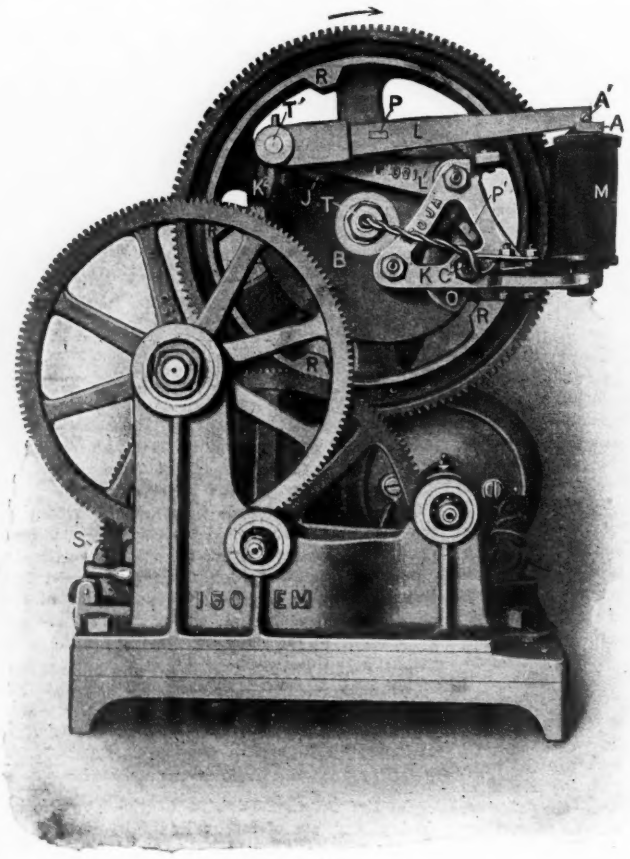


Fig. 2.

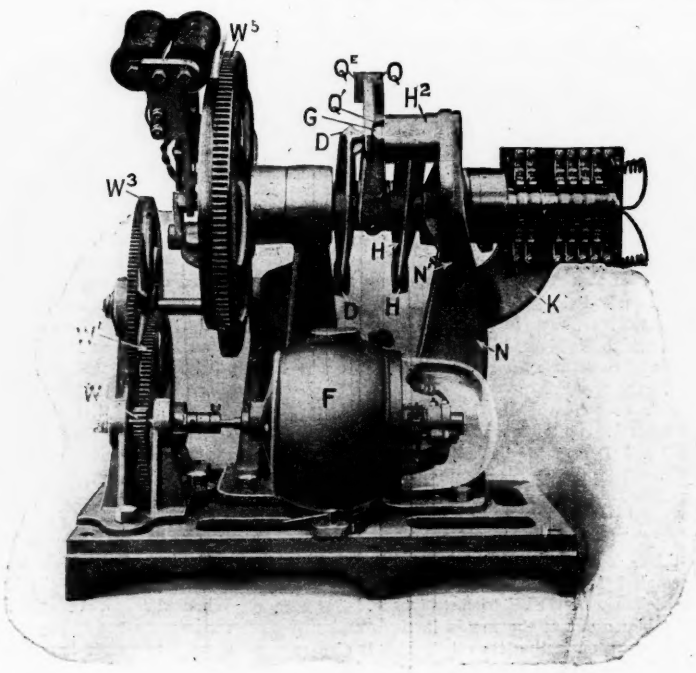


Fig. 3.

Electric Motor for Semaphore Signal.

applied. At this stage of the treatment the lowest temperature of the timber is about 230 deg. Fahr., so when the vacuum begins to be produced, furious evaporation takes place, and when the vacuum gage reads 22 in. the temperature of the timber is over 50 deg. above the boiling point and there is an outward pressure from the sap cells of about 8 lbs. per square inch. It is necessary to apply this part of the process for from four to 10 hours. The timber is then ready for the antiseptic chemical, which is either creosote oil or zinc chloride, according to the use for which the timber is designed, zinc chloride being used for ties.

It is provided in the general specifications that the creosote oil shall be admitted at a temperature not less than 150 deg. Fahr. and shall be raised to 200 deg. Fahr. by means of the heating coils in the cylinder and pressed into the timber with a force of 100 lbs. to 150 lbs. per square inch. In order that the timber at the bottom of the load in the cylinder shall not receive more than its due share of oil, it is important that the cylinder shall be filled as quickly as possible. For this purpose a tank elevated up above the cylinder holds the oil to be used for treatment and this oil is admitted into the cylinder under the full head of the tank and the great additional force resulting from the vacuum which exists in the cylinder. These combined forces fill the cylinder with oil in less than five minutes.

Water for Locomotive Boilers.

BY WILLIAM M. JEWELL, PH. G.

The selection of the best source, if two or more are available, is often a delicate, if not difficult, task, as it frequently happens that the one of best quality is deficient in quantity. The expense of obtaining the supplies is also a large factor, especially on newly projected lines; and the location of water stations often necessitates the use of inferior water. Neither is it possible to secure supplies of uniform nature. River, creek and pond supplies usually become extremely turbid and highly polluted with organic substances at times; and well supplies frequently change in chemical composition, usually becoming more salty.

The construction of large impounding reservoirs is very commendable and several excellent permanent supplies have recently been developed along these lines. There can be no question of the fitness of rain water from surface drainage of large protected areas. The climatic conditions must be overcome by making them large enough for at least one year's supply in addition to the loss by evaporation and curtailment by freezing. Such reservoirs represent, as a rule, immense investments; and it becomes a vital question whether the charges, such as interest, cleaning and repairs to dams, sluiceways, etc., are justifiable in view of the recently perfected methods of purifying waters on a large scale. This contention, of course, cannot be raised in arid districts where river, lake or well supplies are very remote. Experience has demonstrated that it is better practice, when both are available, to use surface water from almost any source in preference to drilling wells in an unknown district. Surface waters are, as a rule, quite soft, and the suspended matter is easily removed at comparatively slight expense by sedimentation or filtration.

In order to properly classify a water, it is necessary, first of all, to consider the effects produced in the boiler.

(1.) Foaming or priming: This feature is worst of all because it renders the water totally unfit for use, as well as dangerous.

(2.) Corrosion or pitting: Such waters may be used, but they work irreparable injury to the boiler in time.

(3.) Muddy deposit: These waters cause trouble by stopping circulation very quickly, resulting in bagging or burning out the boiler in the water leg and other places where the circulation is sluggish, requiring very frequent washing.

(4.) Scaling (A) Hard; (B) Soft: (A) A hard, incrusting scale is difficult to remove and requires that the locomotive be laid up several weeks for thorough cleaning. It is very tenacious and chiseling is sometimes necessary. Flues burn loose; steaming is very difficult and forcing is dangerous. (B) Soft scale, if quite dense, acts in time like mud. It usually shifts under heavy firing and requires frequent removal. A large portion can be washed out, and what remains is quite easily detached.

Waters may be classified in relation to the above as follows:

(A) Impounded rain (surface drainage) water.
(B) Lake waters (fresh).
(C) Well waters—containing carbonates of lime and magnesia.
(D) Well waters—containing sulphates of lime and magnesia.
(E) River and creek waters—muddy.
(F) Well waters—acidulous.
(G) Well waters—strongly saline.
(H) Alkaline waters.

The judicious application of water to the boiler is a matter of no little importance. In boilers the interim between cause and effect is generally quite short, as the water is rapidly concentrated and its action thereby greatly multiplied. This is especially true of waters of the first class, which produce foaming. For example, a locomotive boiler run 500 miles between washings will evaporate approximately 30 times its holding capacity. Starting with a water containing only ¼ grain of alkali (carbonate of sodium) per gallon, this is increased to 7.5, or nearly the permissible limit (10 grains), where foaming begins. It is not infrequent to find waters running over five grains of alkali per gallon. With such water the locomotive would have difficulty in running at all except with a light load. The usual practice is to "blow off," thereby keeping down the specific gravity of the water in the boiler until water from some other source may be had. If the next station happens to have a scaling water, of class "D," the concentrated alkali in the boiler will react on the sulphates of lime and magnesia, precipitating them as carbonates or "soft scale" and forming sulphate of sodium of the alkali carbonate. This reaction is very beneficial in preventing a hard scale, and, furthermore, reduces the liability of foaming, as the sulphate of sodium is much less liable to foam. It follows, therefore, that it is both economical and quite necessary to intersperse hard waters of this character with alkali waters in preference to using a soft water.

Where corrosion is due to waters of class "F" the same benefits will result by alternating with waters of "C" or "H" class. Corrosion from heavily charged saline waters (class "G") is reduced, but not satisfactorily abated, in this manner. Interspersing with class "A" and blowing off is better, and will often allay the trouble by reducing the specific gravity of the chloride salt in the boiler.

Waters containing soluble sulphates in considerable quantity should not be alternated with waters of class "C," as an otherwise soft scale will become hard due to formation of sulphate of lime.

Lake waters as a general rule are quite soft and contain carbonates of lime and magnesia principally, and they may be considered as representing the best of class "C." River waters are generally more complex, containing both carbonates and sulphates—quite frequently more sulphates than carbonates. On account of the unusually large amounts of suspended impurities they make a semi-hard scale, and they should be interspersed with waters of class "A" or "H." Quite often we find the change in waters introduced loosens the scale. Of course, such conditions must be kept under control.

The great value of a thorough understanding of these principles and their efficient application can only be obtained by chemical, as well as engineering research. This has been quite forcibly evidenced by the roads that employ chemists of their own and give them proper facilities and time for work in connection with the water service department.

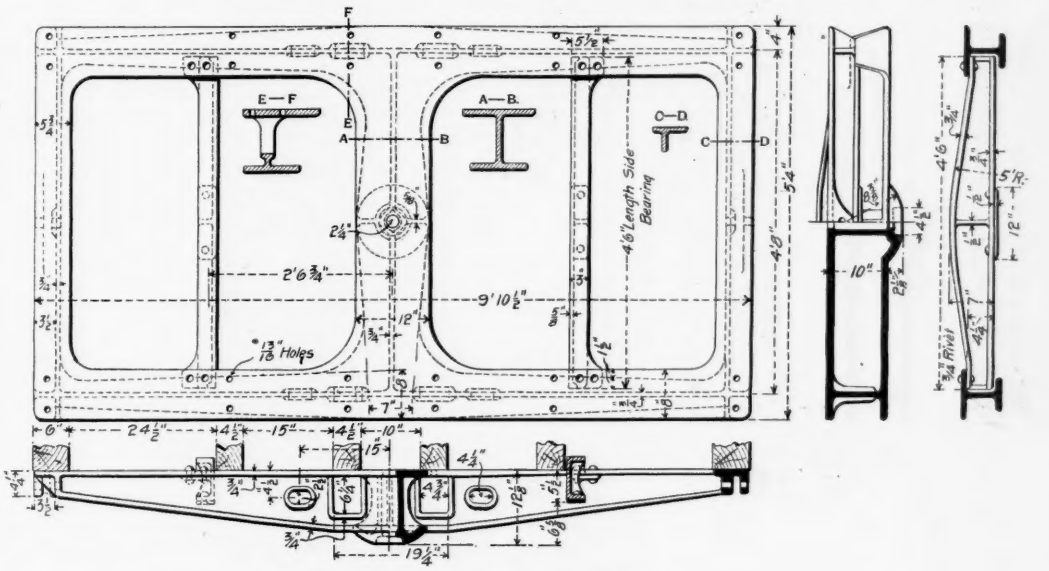
Waters are now being purified on a large scale very successfully. In most cases "reagents" are applied, and this is followed by sedimentation or filtration in order to remove the precipitated substances. Three general types of plants are used, viz., distillation, softening and filtration. Distillation plants are principally used on ships to make up the losses by leakage. This would be the panacea for locomotives also if condensation were practicable. Of late years rapid strides have been made in air cooling or condensing devices, and it may not be anticipating too much to predict their successful application to locomotives in the near future. Distillation on a large scale in vacuum at 143 deg. C. is certainly economical on waters of high alkali composition. A partial distillation may suffice in many instances.

Softening plants are applicable to waters of classes C and D, and develop remarkably good results when properly constructed and the right kind and amount of chemical "reagents" applied. It is not at all impracticable, in fact is very economical, to remove as high as 95 per cent. of the carbonates or sulphates of lime. This has been accomplished on exceedingly hard waters. The magnesia salts are, as a rule, less susceptible to the treatment than the lime salts; but they are likewise less objectionable. Fifty to 70 per cent. removal of magnesia salts is not uncommon. Where waters of class "D" are softened care should be taken not to have over 40 grains of sulphate of sodium remaining, as it will cause foaming. Hence soda ash should in no case be used to excess. On this account the devices for its introduction should be automatically governed by the flow of water. Most of the systems now on the market provide these features in a more or less efficient manner.

The removal of suspended matter in river, creek or pond waters, such as clay, silt, mud, organic matters, etc., is best accomplished by filtration. The usual practice is to add a "coagulant," such as a salt of iron or alumina, to the water before filtering. This is generally added automatically by means of a chamber through which all the water flows; the water taking up only the requisite amount, about one-quarter to one grain per gallon. The effect of this coagulant is to mass the impurities together, like the white of an egg in clearing coffee. It is precipitated and remains in the filter with the other substances. Sand is almost universally employed in these filters.

Cast Steel Double Body Bolster.

The increasing favor with which the cast steel bolsters for freight cars have been received has naturally led to the design of a special type of the same material for passenger equipment. The engraving shows the general form and dimensions of a double body bolster recently brought out by the American Steel Foundries which is being used on a number of new cars. It consists of one main casting forming the frame of the bolster and two separate bridges for the side bearings, which are riveted under the top flange of the transverse members with two rivets at each joint. These bridges are cast with a channel section, the main casting being of I section except the two outside members, which are T section with the flange on top. The body center plate is cast integral with the center members, and is reinforced with four ribs ex-



Cast Steel Double Body Bolster.

tending up to the top plate. The average thickness of the webs and flanges is ¾ in. and the weight of the complete bolster 1,710 lbs. A test of one of these castings, which was made for a number of 80,000 lbs. baggage cars of the Missouri Pacific, showed the following deflections.

Load, tons.	Deflection, in.	Set, in.
30	¼	....
40	5/16	....
50	⅜	....
60	7/16	....
70	½	....
80	9/16	....
90	11/16	1/16

It was loaded at the center and held on two supports 8 ft. 3 in. apart. The test shows the strength and rigidity of such a design, and this has been further emphasized by the results in service. The car sills have an ample bearing on the extended top plate, and are securely held in place at all times. In the ordinary construction the strength of the built up bolster depends largely on the rigidity of the sills, but in this design the bolster forms a cradle for the car and adds strength to the whole construction. The form of this type of bolster is such that it may easily be modified without loss of strength to suit almost any arrangement of underframe.

Russia should at this time, apparently, be a more formidable competitor of our grain-growers than ever before. The Minister of Finance has recently published statistics of the production of the last harvest, showing a total in European Russia of 70,947,000 tons, which is much the largest ever known, and 34 per cent. more than in 1901. At the same time, certain districts in Russia did not produce enough for their own consumption (as in so big a country is likely to happen in almost every year), and last fall there was more talk here of the deficits than of the surpluses which so greatly overbalanced them. It is the carrying of the grain which almost every year blocks the Russian railroads, or some of them. Apparently the grain growers have very inadequate provision for storing grain on the farms; wet weather in the fall and again in the spring makes the roads to the stations almost impassable; and as soon as the grain is threshed and the roads are fit, the grain is rushed to the stations, often in such quantities that it can neither be properly stored there, nor forwarded for weeks.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

It is not usual for brotherhood leaders to be as frank as was Mr. Garretson, of the Order of Railroad Conductors, in his admission to Mr. Ward, general manager of the Great Northern: "The essence of this movement is to put on more crews. . . . When we limited the mileage made by freight trains, or local trains and passenger trains, we did precisely the same thing. We made employment for more men." The demands made on the Great Northern were for an increase of pay—which was promptly granted—and for double pay for each man working on a train hauled by two locomotives. About 3 per cent. of this company's present freight-train mileage now has helpers, and the alternative offered by the brotherhoods to the company is that these helper engines shall be withdrawn, for the reason given above. It is a demand that transportation shall be done uneconomically for the purpose of giving employment to more men. The brotherhoods' error is, of course, the apparent belief in their right to take part in the management of the corporation which employs them; and that wasted labor, at any time in the history of the world ever benefited the laborer, or any one else. This belief is based on a theory generally accepted by trade union men that an employee, or an officer, although he has been fully paid for his work, has a form of ownership, a right to share in the profit of the product—as if a shoemaker had a lien on shoes which he had made and had been paid for.

Discipline, as it is described on the Delaware, Lackawanna & Western by the enthusiastic and somewhat wordy correspondent in another column, seems to be a matter of ethics and diplomacy. It is fair to say that the correspondent, who does not want his identity known, is in a position to know thoroughly and "speak advisedly" of the work that he tells of. Qualifications for handling men are probably rarer and should be higher-priced than those which go to make a sound constructing engineer. The product should be trainmen who are as hard as nails in the performance of duty, and the division superintendent's serious difficulty is that he cannot frequently and surely find out the stuff his men are made of by a physical drop test, or by chemical analysis. He has no "test pieces" from which to determine the qualities of his men; he must rely on endurance tests, under the peculiar condition that a considerable proportion of the observed failures involves calamities. The D. L. & W. method is described as the painstaking method, which takes time, and so much of it that it would seem to keep one man on a division quite busy. The two notable fatal derailments of this week were due to lack of discipline, one over-running a signal, and the other a misreading of a train order, and as this is the not unusual record, an extra salary for a disciplinarian might be justified. But this is a complication to be avoided if possible by having the division superintendent's work so allotted that he can have surveillance over his men. The correspondent's comparison of this daily work to that of Admiral Sampson's blockade of Santiago is startlingly apt.

The New Westinghouse Electric Train Control.

A little less than six years ago, when Mr. Sprague was showing some astonishing accelerations with trains fitted with his multiple control, one editor, almost immune to new ideas, said: "Yes, that is very fine, but think of the first cost and the cost of maintenance." Mr. Sprague did not bother himself to argue the matter, he dismissed the editor's apprehension with the remark that "Suburban transportation is merely a matter of seduction. Attract the people with quick service and don't worry about the cost." In the short six years that have passed, men have learned that they must use trains of motor cars to attract the people and to take care of them. For suburban or city traffic the electric locomotive is already as archaic as behemoth. The means of controlling from the head of a train the motors on five or six or perhaps twelve cars had to be invented and developed to order. It was not a case of an art flowing from invention; real invention was demanded for a specific purpose. It was inevitable that means devised under such pressure, to perform duties so difficult and novel, should be complicated, and somewhat low in mechanical efficiency. This is generally true of new machines. The first contrivances are complicated, but as they develop in use the organs are simplified even though the functions increase. If any one will take the trouble to examine the cars now running on any of the elevated roads he will be astonished at the size, weight and complexity of the control apparatus. This is true of all the forms now in use. A man of mechanical instinct knows (even if he is not familiar with this narrow field in engineering) that he is face to face with primary invention. It does not surprise him, therefore, to find at any moment that a revolution has been made in methods of multiple control; he is prepared to expect it. It looks as if such a revolution had come. A man of great inventive power, who has worked in this particular field ever since it was opened, and who has a successful control system now in use, suddenly comes forward with an apparatus that saves weight, space and current. He reduces the weight of the control apparatus some fifty per cent., cuts down the space occupied in about the same ratio and brings in the positive and practically unlimited power of compressed air to work the parts. Three-fourths of a ton weight is saved on each car. A little arithmetic will enable one who has the data, to convert this into ton-miles and thus get the saving at the coal-pile in any given case; and doubtless the saving in maintenance and in space occupied will be quite as important as the saving in weight carried.

The Car Wheel and the Brake Shoe.

The possible behavior of the cast iron car wheel under the high capacity cars is a serious matter, and becomes doubly important in view of the fact that the 100,000 lbs. capacity car may not be the limit in size. Train speeds are also increasing and adding burdens to the car wheels. The failures at the present time are due largely to the action of the brake shoe. This factor was not formerly carefully considered, and the problem was supposed to be fully stated as follows by a prominent car wheel maker some time ago: "The number of wheels per car being the same under a 50-ton car as under a 12-ton car, and the increase in load being 333⅓ per cent., and the increase in guarantee being 100 per cent., there is a demand for increased efficiency in cast iron car wheels of 433⅓ per cent." This is approximately true, but an important feature was overlooked; namely, the increase in train speed since the 12-ton car was the standard. For instance, a 100,000 lbs. capacity car moving at 40 miles an hour contains about 5,000,000 foot pounds of energy which must be absorbed and dissipated by the action of the brake shoe upon the tread of the wheel in coming to rest. On the other hand, a 30,000 lb. car moving at 15 miles an hour contains about 200,000 foot pounds of energy. In other words, in addition to the extra burden due to increase in weight the amount of energy transformed into heat by the action of the brake shoe in bringing the car to rest has been multiplied by 25.

The car wheel makers have been called upon to meet these modern conditions and the wheels have been brought to a higher standard of excellence. Credit is due the makers for the splendid results which they have obtained. Not many years ago it was not usual for chemists to be employed by wheel makers and the mixtures were neither uniform nor proper, but the composition has been reduced to a pretty well-defined standard and the methods of moulding have been greatly improved. Iron high in titanium is claimed to give greater density and transverse strength and at the same time it allows a hard chill or wearing quality in the tread. When the drop test for wheels was first instituted test bars were thought good enough if they broke at 1,800 to 2,000 lbs. transverse strain. Now bars will withstand a load of 3,500 lbs. twice without breaking.

Failures in car wheels have by no means been eliminated, but the betterments have so far kept pace with the increased demands, as is shown by a recent report to the New York Railroad Club that on the Central of New Jersey, out of 8,000 wheels under 1,000 hopper cars put in service in 1901, but two had been removed for shelled out tread, two for burst hubs and two for cracked plates. These cars were in service carrying an average of 88,000 lbs. of coal to tide water. In 21 months only six of these 8,000 wheels had to be removed which were chargeable to the maker. It is a matter of great interest to know that the cast iron wheel will successfully meet the increased demands, and it would indeed be a serious money loss if cars had to be provided with the steel-tired wheel, for even the steel-tired wheel has developed many of the defects thought to be inherent to the cast iron wheel. It has been shown by experiments that the transverse cracks which appear in the tread can be reproduced artificially by surrounding the tread of the wheel with a thin layer of molten metal, indicating that such defects are directly chargeable to the heat action of the brake shoe. The crack having once been started, it soon develops, in some geometrical ratio, by the pounding over rails, frogs and switches, with the result that a shelled-out spot appears.

The maximum braking pressures are generally fixed at 70 per cent. of the light weight of the car, but recently several roads have equipped some of their cars with what is called the "empty and load" device, so as to vary the braking pressure according to the total weight on the wheels. This is well, for any device which increases the efficiency of the air-brake is commendable; but these improvements in the air-brake increase the destructive effects on the car wheel. The temperature to which the wheel and shoe rises while making a stop is inversely proportional to the length of the stop, for, with a given amount of energy to be dissipated the temperature becomes a function of the time during which the energy is being transformed into heat. Therefore, all improvements which have for their purpose the shortening of the time of stopping will increase the temperature of the brake shoe and car wheel.

In this connection it is interesting to recall that during the Berlin-Zossen high-speed trials it was proposed to equip the test car with independent braking disks, inasmuch as difficulty was experienced from the high temperature reached during a stop. Such a device would, without doubt, simplify the problem of car wheel design, but at the present time such methods are impracticable owing to the constructive features of car trucks. It is not impossible, however, that at some time in the future the brake may be applied to some other point than the wheel tread. In the meantime still more can be done by giving closer attention to the composition and manufacture of car wheels and brake shoes.

Lake Shore & Michigan Southern.

The two things which stand out most prominently in Lake Shore reports are the low capitalization and the uniform increase in train loads. In 1879, taking the sum of capital stock and funded debt, the road was capitalized at $74,289 per mile. In 1885 this had fallen to $72,735; in 1890, to $66,447, and in 1895, to $65,810. At the present time, the figure is $70,830, but the seeming increase is offset by the fact that old bonds have been retired by the issue of new ones bearing a much lower rate of interest. Since June 1, 1897, $37,094,000 of old bonds have been retired, with the net result that the bonded debt has been increased $6,750,000, but an annual saving of $1,062,400 in interest charges has been effected. The capital stock has remained unchanged at $50,000,000 since 1871. At that time, the property included 94 miles of double track and 259 miles of sidings, and the main line was laid almost entirely with iron rails, weighing 60 lbs. to the yard. The number of locomotives owned (and they were light ones) was 346, and the total number of cars, 7,221. At the close of 1902, there were 522 miles of second track, 874 miles of sidings and the rolling stock consisted of 616 locomotives and 24,385 cars. This is a notable example of what can be done with earnings. The *Railroad Gazette* in 1895 printed two articles by Benjamin Reece, M. Am.

Soc. C. E., describing the early and persistent efforts of the company toward the specific purpose of increasing the train load. Under the watchfulness of Chas. Paine, General Superintendent, the revenue load was brought up from 159 tons in 1874 to 237 in 1879, and in 1881, a second series of improvements was inaugurated, involving grade reduction, the building of third tracks, etc., which has continued to the present time.

The train load showing is the more significant when it is realized that it was accomplished without increase in capitalization. During 1902, 576 tons of revenue freight were carried per train mile, as against 530 in 1901, and 455 in 1900; 25,729,614 tons of freight were moved in 1902 as against 22,848,372 tons in 1901, yet the mileage run by freight trains decreased 521,347 miles. The average haul of revenue freight decreased from 186.1 miles to 168.5 miles, but the company secured a slightly better average rate per ton—.517c., instead of .489c.—so that freight earnings showed a good increase, amounting to over 21 millions, as against $19,606,097, in 1901. Thus, the decrease in the movement of anthracite coal and in grain, as shown by the lessened average ton-haul, was completely covered by the increase in movement of commodities of a higher class, indicated in the increased ton-mile rate. During the year there was a decrease of 26,330 tons in the movement of petroleum and other oils, but all other commodities listed as manufactures increased 610,840 tons.

Passenger earnings fell off from $6,805,208, in 1901, to $6,461,094, but the decrease is no greater than would be expected after the cease of the Pan-American travel. As compared with 1900, passenger receipts increased considerably over $1,000,000.

Operating expenses for 1902 were $21,989,064, as against $20,210,229 in 1901, but all taxes, new equipment, and betterments were charged to this account, which included $1,423,673 for equipment, $203,144 for new side tracks, and $2,768,788 for construction and betterments; $3,236,608, or $2,293 per mile, was spent for maintenance of way, and $2,687,276 for maintenance of equipment. The result of this policy has, of course, been that earnings are greatly in excess of dividend requirements, and the road would be in a position to face long stretches of bad years without loss to the stockholders. Even allowing the liberal expenditures for maintenance, if the "extraordinary expenses" had been charged against capital, and a dividend paid to the full amount of surplus earnings, as in English practice, the stockholders would have received something like 22 per cent.

The item of bills payable, which stands at $5,000,000, has been increased $1,000,000 during the year, but against this increase the company has acquired 96 per cent. of the entire capital stock ($5,000,000) of the Indiana, Illinois & Iowa; 50 per cent. of the entire capital stock ($1,500,000) of the Detroit, Toledo & Milwaukee, and 50 per cent. of $2,000,000 new stock of the Pittsburgh & Lake Erie, the total cost of these holdings being $5,678,000. The sum, which is $4,678,000 in excess of the increase in bills payable, was paid out of the company's current means. A comparison of the balance sheet and income account for 1902 and 1901 shows an increase in assets of $4,328,862, as against an increase of $1,088,391 in liabilities, leaving a net increase of $3,240,471. The balance to the credit of the income account was $18,035,138, as against $14,794,667 last year.

Mexican Central.

In addition to the troubles of ordinary railroad managements, the Mexican properties have constantly to contend against the depreciation of the currency which they are forced to accept in payment for transportation furnished. This confusing factor must always be reckoned with, necessitating two sets of accounts, since, speaking broadly, the company has to pay two or three dollars of income for every dollar with which it buys material or pays interest. The maximum price at which the company sold Mexican silver dollars during 1902 was 46.55 cents and the minimum was 36.56, the average for the year being 42.16, as against 47.82 cents in 1901. The net loss for the year occasioned by this depreciation is estimated at $768,965, or $135,860 U. S., for each cent of depreciation in the gold value of Mexican silver dollars.

In the latter part of the year the Mexican government decreed that duties on imports should be collected on a basis of 220 exchange, thus fixing a minimum price of 45.45 cents gold for the Mexican dollar, in respect to government revenues from imports. The principal railroads, being in the same situation as the government, in that they have a large foreign debt payable in gold, joined in a petition for authority to collect their tariffs on the basis of 200 exchange, equivalent to 50 cents gold, for the Mexican dollar, and it is expected that early and favorable action will be taken by the government on the petition.

Taking into consideration the currency difficulty, however, the showing for the year is poor. Gross earnings reported in Mexican currency were $21,132,227 on 2,621 miles worked, as against $17,493,673 on 2,135 miles worked last year. After deducting operating expenses and reducing the result to United States currency, net earnings were $2,513,384, as against $2,384,598 in 1901. This comes to $959 per mile, U. S., net, as against $1,117 per mile in 1901 and $1,279 in 1900. The interest charge, as in 1901, was in excess of net earnings, and the deficit for 1902 provided for by the withdrawal of the requisite amount from the Subsidy Trust fund amounted to $496,403. At the time the settlement was made with the Mexican government, $6,122,646 of the proceeds were invested in priority mortgage 5 per cent. bonds to the par value of $5,597,000. This is an investment by the trustee for the same purpose as the Subsidy Trust fund, the balance of the latter outstanding being $1,812,795, so that the security for interest charges on the consolidated mortgage bonds at the end of 1902 was $7,935,441, in addition to net earnings. In 1899 and 1900 net earnings afforded a surplus over interest, but it has almost always been necessary to take funds temporarily from this reserve in order to meet fixed charges. It is pointed out, however, that if the average price of the Mexican dollar had been the same in 1902 as in 1901, net revenue would have shown a surplus of $272,562, United States currency above charges, and it is to be hoped that better results can be obtained in the future if the government permits rates to be adjusted according to the exchange basis previously mentioned.

The Monterey & Mexican Gulf, purchased in November, 1901, was added to the operated mileage March 1, 1902. This addition is mainly responsible for the decrease in net earnings per mile of line, but it is important to the Mexican Central, because the latter now controls exclusively the traffic of Tampico, the most important Mexican port.

Total gains in freight traffic during the year amounted to nearly 20 per cent., and the gains in passenger traffic were over 26 per cent., as compared with the year previous. The smelter of the American Smelting & Refining Co. at El Paso, Texas, was destroyed by fire in 1901, causing a heavy loss to the company in gross earnings that year. In 1902 it was rebuilt by its owners, who inaugurated a system of distribution of ore between its various smelters in the United States and Mexico which considerably reduced the hauls and the quantities exported from Mexico, so that the earnings on export ore were $445,000, Mexican, less than in 1900. But the railroad company considers that the profits of the local traffic incidental to the new method will prove greater than the former export profits, in spite of the fact that the back haul of ore on northbound trains is taken away.

The amount charged against operating expenses during the year for maintenance of way and of equipment was $5,971,488, Mexican, and in addition to this $3,334,406, Mexican (equivalent to $1,421,690), was charged to capital. The difference between the weight of old rail and of new is charged to capital in this company's accounts, as is the difference in cost between the renewal of a temporary bridge and the installation of a new one; a practice which occasions an insidious increase year by year in the heavy load of outstanding obligations.

Having in mind the good crop prospects for the present year, especially as regards cotton, the increasing business at Tampico, and the chance of an authorized exchange rate for currency received, it may be said that the outlook for the coming season is better than it has been in a number of years.

Judge Dickinson in the District Court at Omaha issued an injunction on May 12 restraining the Business Men's Association from many known species of activity. The Association was formed as a retaliative measure against labor union methods, and proposed to remedy them by going them one better. But organized labor, as represented by its attorney, has secured an order which restrains its adversary from doing anything it presumably intended to do; also

From imposing any fines upon its members or any person for violating any agreement not to employ organized labor or not to recognize a labor union.

From receiving or paying out any money whatever in pursuance of any agreement to break up labor unions, except attorneys in this action.

From paying or offering any money to officers or members of unions directly or indirectly as a bribe to do or not to do any act in pursuance of any agreement of any of said defendants against such unions.

From importing or engaging agents or servants to import any laborers into the City of Omaha or State of Nebraska, in pursuance of any existing plan to destroy labor organizations or under any similar or new arrangement or plan.

From bringing any other injunction suits or actions, in pursuance of any general plan of prosecutions to break up labor unions, or of any new or similar plans connected directly or indirectly with any existing plans.

The clause which makes bribery a subject for injunction is fresh and novel in the field of jurisprudence. Moreover, it looks unnecessary, as all that was really essential would seem to have been a simple order enjoining the Association from performing any act whatsoever. It is to be hoped that the unhappy object of all this legal phraseology will find its restraining fetters so very uncomfortable that it will devise some more harmonious method of solving labor difficulties than that of matching strike with lock-out, and boycott with boycott.

NEW PUBLICATIONS.

Das Eisenbahngleis. By A. Haarmann, General Director of the Georgs-Marien-Bergwerks & Hütten-Vereins. 277 pages, 8½ x 11½ in., with 503 text illustrations. Breitkopf & Hartel, Leipzig, Germany, 1902.

The author has supplemented his previous volume (1891) with the present work on railroad superstructure, an illustrated extract from which is printed elsewhere in this issue. With the thoroughness characteristic of German critical work, a detailed account and critique is given of representative practice in rail and tie structure, ballast, fastenings; in short, everything above grade which appertains to superstructure proper. Herr Haarmann is one of the best known German authorities on track, and includes in his study not only the railroads of his own country, but also those of England, America, France, and many other countries. After reviewing the experiences during the past decade of the principal lines in all parts of Europe and America, the author speaks of the long array of instructive and practical lessons which may be thereby learned. The track appliances, upon which the critical discussion of the various systems is based, have been subjected to comparatively short service, since their origin has been within very recent times, but initial wear and the behavior of the parts of the superstructure in other respects offer sufficient basis for study. Comment is made on the fact that, while the wooden transverse tie superstructure has been everywhere most carefully developed, the same attention has not lately been given to the use of metal ties. A thorough discussion of the various methods of making joints is also taken up, and of what the author designates the "strong-joint superstructure" method, and its experimental trial, in 1901, between Hasbergen and Osnabrück. The excellent wood cuts with which the work is illustrated add greatly to its value.

Notes on Track Construction and Maintenance, by W. M. Camp, editor of the *Railway and Engineering Review.* Published by the author at Auburn Park, Chicago.

This is a volume of 1,200 large octavo pages, with more than 600 engravings and nearly a million words. The pictures of track materials, tools and structures are excellent, and in the discussion of each topic the author has plainly aimed to leave nothing unsaid. This worthy ambition has the natural result of making the book rather large, and its acceptance by a regular publisher difficult. As to this, the author, in his preface (with the autobiographical frankness of Benvenuto Cellini) says: "The manuscript for the book, in its present form and scope, went seeking a publisher more than six years ago, but for a time it seemed that the chase would end unsuccessfully." The "chase," or rather the cycle, ended where it began. The author found himself and became his own publisher.

Unnecessary wordiness is the only criticism that should be made on this magnificent piece of work. It is a great collection of observed facts in a difficult art, made by a man who has done his own seeing, whose serious purpose is never in doubt, who has relied on himself in a manly way that wins the respect of the reader.

Statics.—By L. J. Johnson, C.E., Assistant Professor of Civil Engineering in Harvard University. New York: John Wiley & Sons. 133 pages, 6 in. x 9 in., 48 illustrations. Price $2.

The book is written for students of engineering and architecture. It has been the aim of the author to show the inherent mathematical limitations of pure statics, and a graded set of problems are given illustrating the uses of statics in engineering practice. Most of the problems have been worked out both graphically and algebraically. The author lays particular stress on the necessity of correctly showing the forces in the solution of any problem, as the failure to do this is no doubt a fruitful cause of error. There appears to be a considerable amount of matter in the first two or three chapters which might well have been omitted, as that part is devoted chiefly to definitions.

The Manual of Statistics, 1903. 1,044 pages, 5½ x 8. Price $5.00. The Manual of Statistics Co., 220 Broadway, New York.

The edition at hand is the 25th annual issue, and has a greater number of pages than any previous issue. The book is not too bulky for convenient handling, however. It contains financial statements, market prices of stocks, etc., of railroads, banks, and various industrial companies. Street railroads, in the current issue, are classed with industrials, on account of the prevalent tendency to combine with lighting and power plants. Considerable space is given to statistics of produce, cotton, petroleum, mining, etc.

TRADE CATALOGUES.

Passaic Steel Company, Paterson, N. J., has published a new edition of the handbook which it has from time to time issued for the use of its customers. It is compiled by George H. Blakely and contains a large amount of information about the properties of the various structural shapes made by this company. The tables have been computed especially for this manual and many are original in both form and matter. Extensive tables are given showing the properties of columns of various shapes and the proper spacing of steel beams for various floor loads. Together with these are some valuable practical notes on column formulae as adopted by the Building Department of New York City. It is bound in red leather and contains 324 pages with a complete index. The book is intended for free distribution to the patrons of the company; to others a charge of $2.00 is made.

The Turner Construction Co., New York, which is a licensed agent for the Ransome system of concrete-steel construction, has printed an interesting little book describing this system of using concrete in buildings. The difference between this and other methods of using concrete as a building material lies in the use of cold-twisted

steel bars embedded in the walls and floors to give the required tensile strength which is lacking in plain concrete. As applied to structures in general the walls and floors are made of machine mixed concrete in which is embedded a network of steel rods. Any steel or iron columns are covered with a shell of mortar which experience has proven to be an effective preventive of corrosion or loss of stability under the action of moderate heat. Buildings put up with this construction are proof against the effects of fires occurring within or without the walls and examples are given in the pamphlet of the destructive power of fire on so-called fireproof structures of steel alone and the ability of the concrete-steel construction to effectually withstand the action of intense heat with little or no damage. The book is profusely illustrated with photographs of buildings in course of construction showing the method of erection.

Multiple Drills, is the title of a large and handsomely illustrated catalogue just issued by the Niles, Bement, Pond Co., New York. The tools shown include not only the standard heavy multiple drills made by this company and adapted to railroad and general work, but also several machines built for the drilling of duplicate parts on light work. The machines are of two general types; multiple drills in which the spindles are adjustable to any position in a given line, and adjustable multi-spindle drills in which the spindles may be arranged in a group of any shape or size within the capacity of the machine. Multiple drills may be economically used in many lines of railroad construction and repair work, and the machines shown in this catalogue have many superior points of construction and operation which make them particularly adaptable to this class of work.

Pure Water.—The New York Continental Jewell Filtration Co., New York, has issued a small pamphlet describing a system of obtaining an ample supply of pure water for public buildings, hotels, clubs and private houses by means of gravity and pressure filters which effectually remove all organic matter. They are made in all sizes and capacities for domestic and manufacturing purposes. The principle upon which these filters act is the coagulation of organic matter, before the water passes through the sand bed, by the introduction of small quantities of dissolved sulphate of alumina which unites with the foreign matter and is held in suspension in the sand bed.

The J. G. Brill Co., Philadelphia, Pa., has sent out a pamphlet describing the Brill 27-G truck, designed for city and suburban electric cars. This truck embodies the essential details of the 27-E truck, together with a short wheel base and a construction allowing the car body to set down low. It is capable of a speed of 30 miles an hour with safety. Solid forged side frames, semi-elliptical spring equalizers and spring link suspension are the features which commend this type for the service intended. The appearance of the catalogue is in keeping with the high standard of the other numerous publications of the company.

The Weir Frog Co., Cincinnati, Ohio, is sending out its catalogue No. 6 for 1903-4. It is a substantially bound volume of 331 pages, containing illustrations and descriptions of a complete line of frogs, switch stands, crossings, switches, and kindred devices. The method has been adopted with this issue of giving figure numbers for the various designs of the devices. There are in the back diagrams of street railway special work; also a number of tables giving data of interest to trackmen.

H. B. Underwood & Co., Philadelphia, Pa., makers of portable tools for railroad repair shops, have published an illustrated catalogue of their specialties. These include boring bars for valves and cylinders, planing and facing machines, milling machines, crank pin turning machines and many others. These tools are intended to be taken to the work and they have their uses in every repair shop where simple repairs only are made.

Walter Macleod & Co., Cincinnati, Ohio, have issued several small pamphlets descriptive of the labor-saving specialties made by them. These specialties comprise oil painting machines, whitewash sprayers, blacking swabs, oil rivet forges, blow torches, Buckeye lights and heaters, asphalt surface heaters, etc. The pamphlets illustrate and describe these devices and indicate their various applications.

The Peabody Coal Co., Chicago, has issued a new list of coal mines and coal railroads in Illinois and Indiana; also a large map showing their location. The contents of the book include an index of the roads with the number of mines owned by each; an alphabetical list of all mines in both States; a list of coal washing plants, and other similar matter of interest.

Pawling & Harnischfeger, Milwaukee, Wis., have sent us Bulletin No. 13 showing examples of the different types of traveling electric hoists installed since the last edition. Many designs adapted to a variety of uses are shown. Tables and diagrams of standard dimensions are given and the catalogue is concluded with a partial list of users.

Pratt & Whitney have issued a desk calendar in pad form, with selected wisdom from the "Letters of a Self-Made Merchant to His Son" at the top of each leaflet. It is gotten up in attractive shape, and contains reminders of tools made by the company, in addition to the epigrams by Mr. Lorimer.

Vulcan Iron Works, Chicago, Ill., maker of pile driving machinery and outfits for every service, has issued catalogue No. 23, in which are shown many of the specialties in this class of work which the company makes. Railroad pile drivers are separately described in catalogue No. 22, which will be sent to those interested.

The Halladay Journal Box.

The engraving shows a new journal box having a lid designed to make the box as nearly dust-proof as possible. The box itself is made of malleable iron, and in conformity to M. C. B. specifications. The lid is preferably made of steel, though it also may be made of malleable iron. It has an overlapping flange on each of the four sides, and on the upper side the flange is turned under so as to enter and fit closely in a groove in the upper edge of the box. Attached to the inner side of the lid is a stiff spring which bears against the under side of the top wall of the box and holds the lid in place.

The location of this spring relative to the hinge center enables it to lock the lid in its raised position, and also to hold it tightly over the opening when closed. The side flanges of the lid at the upper edge have extensions through which the hinge pin or bolt of the lid passes from one side of the box to the other. The groove in the upper edge of the opening, into which the lip on the lid fits, is made to slope each way from the center so that dust or other foreign matter will tend to jar out at the ends.

The box is the invention of Mr. J. C. Halladay, and is made by the Halladay Journal Box Co., Marion, Ind. It is already in service on a number of roads with satisfactory results.

TECHNICAL.

Manufacturing and Business.

The Rand Drill Company reports the removal of its San Francisco office from 223 First street to the Rialto Building.

G. W. Scott, Consulting Engineer, Chicago, has removed his office from 758 The Rookery to 1301-2 Security Building.

The Pittsburg office of the Western Steel Car & Foundry Co. has been moved from the Tradesmen's Building to the Farmers' Bank Building.

The Independent Railroad Supply Co., Chicago, recently shipped from its Buffalo, N. Y., mill four carloads of "Federal" single-flange tie plates, and from its Chicago mill 10 carloads of "Chicago" four-flange tie plates.

The Lunkenheimer Co., Cincinnati, has increased its foundry output 50 per cent. to meet the demand for its brass and iron steam specialties. A number of new machine tools are being installed as fast as they can be obtained.

The Railway Appliances Co., Chicago, is sending out an attractive advertising souvenir of the Ajax diaphragm. It is a reproduction on enamel paper of a black and white drawing of the diaphragm, surrounding the figure of a typical American girl.

The Illinois Central R. R. has placed with T. L. Condron, Chicago Agent of the St. Louis Expanded Metal Fireproofing Co., an order for 50 tons of corrugated steel bars to be used in the concrete arches for the second track approaches to Cairo bridge.

The Otis Elevator Company will move from the Empire Building, New York, to larger offices in the Whitehall Building, facing Battery Park. The company will soon install eight high pressure inverted plunger hydraulic passenger elevators in the Bessemer Building and Phipps Power House, Pittsburg.

H. H. McDuffee, Chicago Sole Agent for Jordan ballast spreaders, has lately received the following orders for these machines: Chicago, Rock Island & Pacific, six machines; Chicago, Burlington & Quincy, five machines; Lake Shore & Michigan Southern, two machines; Louis Montville Construction Co., one machine. With this order the Burlington will have nine of these spreaders in use.

The Burton Stock Car Co. has sold its entire equipment and its Chicago plant to the Doud Stock Car Co. The headquarters will continue to be at 601 Fisher Building, Chicago. All mileage earnings up to and including April 30, 1903, should be reported to the Burton Company. The officers of the Doud Company are: Levi B. Doud, President; Henry C. Herget, Vice-President; Edward F. Keefer, Secretary and Treasurer; Thos. A. Whitmore, Manager.

The Philadelphia Pneumatic Tool Co. reports having recently furnished all the pneumatic tools for erecting 45 steel bridges which the Southern Pacific Company is building to straighten its line between Ogden, Utah and Reno, Nevada. Orders for chipping hammers, riveters and drills have been received, also, from the Baldwin Locomotive Works, American Car & Foundry Co., Pennsylvania Steel Co., American Bridge Co., Vulcan Iron Works, Toledo, and the Lake Shore & Michigan Southern Ry.

The Pneumatic Signal Company announces that it has purchased from S. Marsh Young the right to use his system of automatic electric track circuit block signals for electric railroads in the United States, Canada and Mexico, and will arrange to place the system at once on the market. It is intended to furnish the same protection for electric lines as the track circuit system does on steam roads. The presence of any pair of wheels on the block section, a broken rail or wire, or an open switch results in a danger signal. The Signal company will organize an electric railway department which will be in charge of Mr. Young. The factory has been until recently at Troy, but the company is now moving into new works at Rochester, N. Y. This plant will cover about 240,000 sq. ft. of floor space.

A. Rieppel, Koeniglicher Baurat, of Nurnberg, Germany, the Managing Director of the Augsburg Nurnberg Manufacturing Co., is visiting this country. Mr. Rieppel's visit to this country was made to interest the Allis-Chalmers Company in the products of his company. A contract was entered into by the two companies giving the Allis-Chalmers Company the exclusive right to make and sell the Nurnberg gas engine in this country and selling rights in many foreign countries, especially the far east and South Africa. The Augsburg Nurnberg Manufacturing Company, under the direction of Mr. Rieppel, has made a phenomenal success with this new gas engine, having within the past few months received orders for some 50,000 h.p. throughout Germany and Spain chiefly for generating electricity and for blast furnace and spinning mill work. One of these engines is being built for an important spinning mill in Northern Germany, where the engine will be operated by producer gas. The engine is double acting.

Iron and Steel.

The Baldt Steel Co., Chester, Pa., has been incorporated in Delaware with $250,000 capital.

The Western Boiler Works, of Denver, Colo., has been incorporated with $100,000 capital by Harry A. McIntyre, Milford T. Gass, Carroll Owen, E. A. Williams and F. C. Adams.

Arrangements are said to have been made for the consolidation of the South Baltimore Car Works, South Baltimore Foundry and the Ryan & McDonald Mfg. Co. at Baltimore, Md., under the name of the South Baltimore Steel Car & Foundry Co., with a capital stock of $1,000,000.

Geo. L. Reis, for eight years General Superintendent of the Bay View Works of the Illinois Steel Co., has been placed in charge of the works of the United States Steel Corporation in South Chicago, succeeding C. J. McCullough as General Superintendent. Richard B. Charlton succeeds Mr. Reis at the Bay View Works.

It is reported that the General Supply and Construction Company, of New York, has secured a contract to furnish 500 tons of steel to be used in the construction of the machine shops of the new navy yard at Charlestown. This is said to be the first instance of foreign steel being used in the construction of United States Government buildings.

It is reported that the Dominion Iron & Steel Co. has made arrangements to build a ship building plant at Sydney, N. S., and to accept the bonuses offered for the establishment of a plant and dry dock in that city. The bonuses offered are $250,000 from the city of Sydney, and $100,000 from the Government of Nova Scotia toward the cost of the plant, and $1,000,000 from the Dominion Government toward the construction of a dry dock.

Converting Narrow-Gage Locomotives to Standard Gage.

In connection with the work of standard-gaging its line the National, of Mexico, is changing some of its narrow-gage consolidation locomotives to standard gage. The change is easily made—most of the old machinery being used. New cylinders and standard-gage axles are applied, and the tumbling shaft and cross pieces are lengthened. The engines will be used for switching in places where the yards are level.

New Westinghouse Control System.

The Westinghouse Air-Brake Co. has equipped the experimental car, John B. McDonald, of the Interborough, with a system of electro-pneumatic unit control recently developed. This apparatus instead of employing a drum controller as in the older type of control mechanism, uses a series of switches which are individually operated by electro-pneumatic apparatus of the same character as employed by the Union Switch and Signal Co. in operating its electro-pneumatic signalling system. The switches are arranged to operate progressively, the valves admitting air to their respective operating systems at the

proper time and rate to prevent sudden rushes of current to the motors and insure a gradual acceleration. Adjustment of the valves can be made to give any required or predetermined acceleration. The details of the apparatus have been in use a long time and the new system consists simply of an ingenious application of a number of well-tested details to a new end. It occupies a relatively small amount of space and weighs about 1,500 lbs. per car less than the original form of control system made by this company.

THE SCRAP HEAP.

Notes.

The Indiana Car Service Association has reduced from 96 hours to 72 hours the free time to be allowed for unloading coal, and the consignees have, of course, "registered a kick."

The Southern and the Louisville & Nashville roads have secured from the United States Circuit Court at New Orleans an injunction forbidding the ticket brokers of that city to buy or sell the reduced rate tickets which are to be issued for the Confederate Reunion, to be held there May 19 to 24.

H. H. Pearson, former President of the New Orleans Railways Co., was tried before the city criminal court in that city, May 8, on the charge of violating the separate car or "Jim Crow" law, in not providing screens to separate negroes and whites in the cars of the company. He pleaded guilty on 11 charges, and was fined $1,100, or 660 days' imprisonment. The fine was paid.

Washington despatches say that the Interstate Commerce Commission will apply to the Supreme Court for a writ of certiorari to permit the review by that court of the case of Johnson vs. The Union Pacific, and other cases, in which the courts have decided suits under the Safety Appliance Law without taking up all of the questions connected with the requirements of the statute as affecting the duty of railroads to provide uniform automatic couplers on all trains. The Johnson case was reported in the *Railroad Gazette* of January 2 last, page 10, where the reader may find a statement of the difficulties which the Commission is now grappling with.

On Saturday last there was a strike of conductors, brakemen, yardmen and baggagemen on the Mobile & Ohio, the published reason being the refusal of their demand for a 10 per cent. increase in wages in freight service, and 7 per cent. in passenger service, which they have been trying to get since January. An officer of the road stated on Monday that the best men had remained at work and that passenger trains were kept running. On Monday night the Federal Court at Memphis issued an injunction on the officials of the Brotherhood of Railroad Trainmen, and the other brotherhoods, to enjoin all persons from interfering with the movement of freight and passenger traffic.

Steam Turbines.

The steam turbine plant of the Hartford Electric Light Co., Hartford, Conn., which at present consists of a 2,000 h.p. set, is soon to be duplicated. The Westinghouse turbines installed here were the first of large size to be used in this country.

Electric Railroads for Quebec.

A project for an extensive electric railroad system through the south shore counties and eastern townships of Quebec is now well under way. It is proposed to build two main lines, one from Montreal to St. Johns by way of Longueuil and Chambly, and the other from Montreal to Valleyfield, following the river bank and passing through St. Lambert, Chateauguay and Beauharnois. It is proposed to build roads suitable for high speed and also to furnish freight accommodations for farmers.

Nickel Steel Rails.

The B. & O. has laid, this spring, 1,000 tons of 85-lb. nickel steel rails on curves where traffic is heavy. Experiments previously made on the same line showed a marked increase in wearing qualities of the nickel steel rails over Bessemer rails. At one point on the line, mild steel laid in 1898 had to be renewed in 1902, while the nickel steel laid in 1897 was found good for several more years of service. The increased first cost of the nickel steel seems to be compensated for by its much longer life.

Proposed Railroad in Honduras.

The Honduras National Congress has recently granted a concession to a resident of the city of Tegucigalpa to build a railroad over the new wagon road now building between Tegucigalpa and the Bay of Fonseca, 80 miles. The new line is designed, primarily, to connect the capital with the important port of Amapala on the Pacific. The concession calls for the completion of the road within one year after the wagon road is finished. Transportation rates must not exceed certain limits prescribed. This concession is for 12 years, but the Government reserves the right to take over the road after six years. It is said that electricity will be used as the motive power.

Beaumont Oil as Fuel.

In a paper read before the Engineers' Club of St. Louis, April 2, 1902, Henry H. Humphrey gives some interesting facts about the comparative cost of coal and Texas oil as fuel. Estimating the heat value of the oil used in a certain plant of 200 h.p. at Dallas, Texas, at 19,000 B. T. U. per pound with a boiler efficiency of 75 per cent., which was guaranteed by the makers of the oil burners, it was found that 3.1 barrels of oil were equal to one ton of coal of the quality previously used which contained 13,000 B. T. U. per pound. Based on a coal bill of $375 a month the saving by burning oil at 45 cents a barrel would be $165, or 47 per cent. At the present freight rates and prices of oil at the wells, crude oil costs in St. Louis $1.14 a barrel, of which the freight rate amounts to $1.05. In order to compete with coal at market rates in that city the price must be reduced below 60 cents. The use of oil as fuel depends largely on the geographical location of the consumer.

Railroad Strike in Australia.

A press despatch from Melbourne May 9 said that all the State-owned railroads of Victoria were tied up in consequence of a dispute between the government and the railroad employees regarding the right of the latter to affiliate with the Victoria Trades' Hall, the headquarters of trade unionism in the colony. The employees of the railroads are practically civil servants, but, the government says, in case of a strike in other trades affiliated with the Trades' Hall the railroad men would be obliged to strike in sympathy. The government therefore informed the employees that unless they withdrew from the Trades' Hall before May 12 they would be dismissed. The engineers replied that unless the order was withdrawn before 5 o'clock the same day they would strike at midnight, leaving their locomotives wherever they happened to be; and this was done. The government has guaranteed double wages for two months to non-strikers, and has informed the men that they will lose their pensions by striking. About eleven thousand railroad employees are involved in the dispute.

Two days later it was reported that the train service, owing to the strike, was most limited, and all business hampered. The sittings of the country and circuit courts had been postponed and the principal timber yards closed.

Inferior Passenger Service in Europe.

I had little opportunity in a hasty trip for other than a surface observation of Continental railroading, but the traveling by rail was the hardest part of our journey. The service, even for first-class, and which, by the way, costs nearly twice as much as similar service in the United States, is so inferior to that furnished by our railroads as to be scarcely worthy of comparison. The general lack of system and indifference to cleanliness and other similar features, so necessary to the comfort of passengers, was most noticeable. The feature which most impressed me as a lesson to be applied everywhere was the great lack, in train and station employees, of care and attention to passengers in giving correct information, and furnishing comfortable seating accommodations. For the most part, it is a scramble to secure seating accommodations, even in first-class compartments. This seems to be but a natural outgrowth of a system under which the largest fee to the porter or train guard secures the best accommodations. While these conditions naturally suggest to a railroad official of this country the supreme importance of courtesy and intelligent attention to the comfort of the passenger, they should also suggest to the public the superiority, both in lesser cost and immeasurably better facilities of the railroads of this country, as compared with those of Europe. I think the American public in its constant demand for increased and superior facilities frequently forgets that the railroads of the United States furnish beyond comparison the best transportation facilities in the world.—*Vice-President B. D. Caldwell, D., L. & W.*

Decision Against the Commission in the Danville Case.

The suit of the Interstate Commerce Commission to enforce its order requiring the Southern Railway to reduce rates from the West to Danville, Va., has been decided by the United States Circuit Court of Appeals at Richmond, and the decision is against the Commission. In this order (see *Railroad Gazette*, April 13 and Dec. 7, 1900), the Commission held that Danville, although not a competing point, ought to have rates which would be more favorable and more nearly equal with those to Lynchburg, because of its importance as a commercial center and of its nearness to Lynchburg. Before the Southern Railway bought the Atlantic & Danville, Danville enjoyed competition, and the consolidation of competing companies was claimed to be the reason why rates are not now lower. The report of the decision now given says:

"The object of the suit was to secure a reduction of the freight rates at Danville, which were asserted to be excessive, compared with the rates in force to Richmond, Lynchburg and other southern cities. The plaintiff (the Interstate Commerce Commission) contended that the Southern Railway sought to take advantage of its own wrong in violating the anti-trust act by treating Danville as a non-competitive point, and charging rates on freight that are nearly double what they are to competitive points.

"The Court below, in rendering its decision, said the evidence is that while there was competition in soliciting business between the Southern and the Atlantic & Danville, this competition did not reduce rates; that the fact that the Danville rates were as low as the Richmond and Lynchburg rates prior to 1886 does not affect the question; that this was prior to the passage of the Anti-trust act, and prior to the reduction in rates by the Norfolk & Western and the Chesapeake & Ohio, and that the wrong, therefore, that is charged against the Southern Railway is the purchase of the Atlantic & Danville road; but as the rates are as low now as they were at the time of the purchase, it does not appear that the defendant has taken an inequitable advantage of the purchase."

Electric Service on the Manhattan Elevated.

The elevated railroads of Manhattan are now maintaining a service representing 165,000 car miles a day. This fact will probably surprise the average citizen less than it will the expert in railroad operations, who better understands what it means. By way of rough comparison, it is more than equivalent to a service of 400 cars a day between New York and Pittsburg, which would require the despatching of trains of eight cars at 30-minute intervals during the 24 hours, and leave cars enough to run two special trains daily as they might be needed. Or it is equivalent to a service between New York and Philadelphia requiring the despatching of five-car trains each way every nine minutes during the 24 hours, with two special trains to be slipped in where possible. The magnitude of the transportation problem involved in the maintenance of a daily service of 165,000 car miles on only about 110 miles of track and with inadequate terminal facilities at the lower end of the city is made evident by these rough comparisons.

The number of persons carried daily by the elevated trains now averages about 800,000. They travel on the average about four miles, so that the average fare is about 1 cent a mile. This is a cheap service, everything considered. The electrical horse-power used in train movement is about 45,000, continuously exerted. It would be physically impossible to maintain this service at present speeds with locomotives. The maximum efficiency of the old engines of the system was represented by 7,000 lbs. drawbar pull. Trains are now started with a power equivalent to about three times that. The running of trains has been accelerated about 25 per cent., the gain being chiefly in starting and stopping. These are still disagreeably abrupt in some instances, but it is a matter which is under control of the motorman. The management is doing all it can to weed out the motormen who will not learn and cannot be taught to manipulate the brakes as directed. The change from steam power to electricity is a success from every point of view. It has enormously increased the efficiency of the system, and in every way promoted in marked degree the public convenience. The people of New York are to be congratulated upon the results attained or in sight from the change of equipment and management of the elevated system.—*New York Times.*

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvi.)

Canadian Railway Club.

At the meeting of the club on Tuesday, May 5, Mr. J. O. Brumbaugh, Foreman Steam Fitter, C. P. Ry., read a paper on "Steam Heating Passenger Cars."

Franklin Institute, Philadelphia.

The programme for the meeting on May 14 included a paper entitled "The Utilization of Blast Furnace Gases for Power Purposes," by Mr. Chas. Kirchhoff, editor of *The Iron Age.*

New York Railroad Club.

At the meeting of the club on Friday evening, May 15, at Carnegie Hall, 154 West 57th street, a paper will be read on "The Transportation Problem About New York City," by W. W. Wheatly, First Vice-President of the Club.

Western Railway Club.

The May meeting will be held in the Auditorium Hotel, Chicago, May 19. F. W. Edwards, Ohio Injector Co., Chicago, will present a paper on "Injectors as They Are Met With in Everyday Railway Practice." After the discussion the annual election of officers will occur.

Engineers' Club of Philadelphia.

A regular meeting of the Club will be held May 16, at 8 p.m. Mr. A. L. Baldwin (visitor) will read a paper on "Recent Rapid Base Line Measures, Precise Leveling and Triangulation," illustrated by lantern slides. At the meeting on May 2, Rear Admiral George W. Melville read a paper on "The Military Importance of Naval Engineering Experiments," and detailed the scope and purpose of the Naval Engineering Laboratory to be established at Annapolis.

American Institute of Electrical Engineers.

Following is the programme for the annual meeting on May 19:

1. Annual reports of officers and committees.
2. Introduction.
3. The Experimental Basis for the Theory of the Regulation of Alternators, by B. A. Behrend, Member, Chief Engineer, Bullock Electric Manufacturing Co.
4. The Heyland Motor, by C. A. Adams, Jr., Associate, Assistant Professor of Electrical Engineering at Harvard University.

M. M. and M. C. B. Conventions,

At a special meeting of the Executive Committee of the American Railway Master Mechanics' and Master Car Builders' Associations at Buffalo, N. Y., May 11, it was decided to hold this year's conventions at Saratoga Springs, instead of Mackinac Island as arranged originally, the Master Mechanics from June 24 to June 26 inclusive, and the Master Car Builders' from June 29 to July 1 inclusive. The Grand Union Hotel will be headquarters. Applications for rooms should be made to Woolley & Gerrans, Saratoga Springs, N. Y., and for exhibit space to J. Alexander Brown, Secretary of the

Supplymen's Association, 24 Park Place, New York City. The rates for rooms at the Grand Union are: Single room, without bath, one person, $4 a day; single room, with bath, one person, $5; double room, without bath, one person, $5; double room, without bath, two persons, $8; double room, with bath, one person, $6; double room, with bath, two persons, $10; extra large double room, with bath, two persons, $12. For rooms at a rate less than $4 a day, it is recommended that applications be made to Congress Hall, the Hotel Worden or the American-Adelphi Hotel. Congress Hall is directly opposite, and the American-Adelphi Hotel on the block above headquarters.

PERSONAL.

—Mr. R. L. Dulaney, a Director of the St. Louis, Vandalia & Terre Haute died on May 5, at his home in Marshall, Ill.

—Mr. E. L. Adams, Jr., recently Division Engineer of Maintenance of Way of the Baltimore & Ohio at Connellsville, Pa., died recently in Boston.

—Mr. W. F. Merrill will go abroad early in June for rest and recreation. His resignation as Vice-President of the New Haven road takes effect June 1.

—Mr. Jeremiah A. Farrington, Purchasing Agent of the Mount Washington Railway, died May 11. Mr. Farrington was born in Conway, N. H., in 1843, and was at one time Purchasing Agent of the Boston & Maine. He was a civil engineer.

—Mr. J. B. Hutchinson, late General Manager of the Pennsylvania, and now Assistant to the Second Vice-President, has returned from his vacation in Europe and has taken up the duties of his new office. Mr. Hutchinson has been elected President of the fire insurance company, recently organized by Pennsylvania railroad interests, the Mutual Fire, Marine & Inland Insurance Company.

—The new Superintendent of the Pacific Division of the Northern Pacific at Tacoma, Mr. W. C. Albee, was born at Madison, Wis., in 1855, and began his railroad service, in 1872, as a telegraph operator on the Great Northern, which was then the St. Paul & Pacific. From 1878 until his appointment as Trainmaster in 1898, Mr. Albee was despatcher on this road and later on the Northern Pacific. In 1902 he was made Assistant Superintendent of the latter company, from which position he is now promoted as above.

—Mr. Herman B. Earling, who, on May 1, became Assistant General Superintendent of the Chicago, Milwaukee & St. Paul (Middle District) was born in 1862. At the age of 16 Mr. Earling became an agent and operator; from 1883 to 1887 he was assistant train despatcher, and then chief train despatcher; and in 1898 was made Division Superintendent at Marion, Iowa. He was later made Superintendent of the Iowa Division of this road, which position he has held up to the time of his new appointment as above.

—Mr. W. F. Sheridan, Superintendent of Transportation of the Mexican International, began his railroad service as a messenger boy for the Baltimore & Ohio at Newark, Ohio, in 1883, and was operator in 1884 and train despatcher in 1887. In 1891 he resigned from this company to become despatcher at Louisville, Ky., for the Louisville & Nashville, and two years afterwards was made chief despatcher. He remained in that capacity on three different divisions until 1900, when he was made Master of Trains on the Henderson Division at Earlington, Ky.

—Mr. R. H. Cobbs, Jr., Superintendent of the Mobile, Jackson & Kansas City at Mobile, Ala., is 38 years old. He was born in Greensboro, Ala., and was graduated at the University of the South, Sewanee, Tenn., in 1885. The following year he entered the engineering department of the Central of Georgia and was with this company during the construction of the Columbus & Western. In 1888 he was transferred to Savannah. In May, the next year, he was put in charge of track laying on the Central of Georgia. In 1891 he was appointed chief clerk and Assistant Engineer in the Superintendent's office of the Louisville & Nashville at Anniston, from which position he now resigns to go to the Mobile, Jackson & Kansas City.

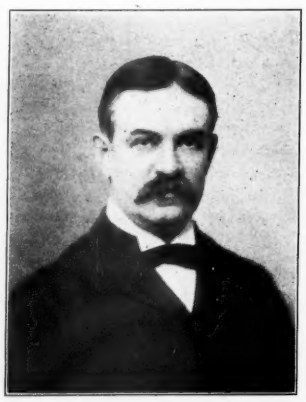
—The new General Manager of the Georgia, Florida & Alabama, Mr. W. M. Legg, is a native of Georgia, having been born at Marietta in 1858. His railroad service dates from 1878, when he began work in the local freight office of the Chicago, St. Louis & New Orleans, now the southern lines of the Illinois Central. He remained with this company until 1883, when he went to the Mexican Central as a conductor. From 1886 to 1892 he was with the Panama Railroad as Master of Transportation at Colon. In 1892 Mr. Legg became a conductor on the Georgia, Southern & Florida, and has, for the past seven years, been Master of Transportation, from which position he now resigns to go to the Georgia, Florida & Alabama.

—Mr. J. C. Homer, who recently succeeded Mr. Passmore as Superintendent of Motive Power of the Detroit Southern, was born in Pennsylvania in 1857, and has been in railroad service for the past 33 years, 24 of which he was Master Mechanic. Previous to this time he was with the McValein Machine Company. His railroad experience began with the Little Miami, where he remained until 1873, when he went south to take a position with the Houston & Texas Central. He was later appointed Master Mechanic of the Los Angeles & San Gabbler Valley. He afterwards returned to Ohio and was at one time connected with the Cincinnati, Hamilton & Dayton. From there he went to the Toledo & Ohio Central, where he remained until his appointment as above.

—Mr. E. P. Williams died at Glenville, Ohio, on May 3, after a long life of quiet accomplishment which should be told to boys and young men as a typical one for their emulation. He was born in Cleveland in 1843; graduated from the high schools and from Hudson College; served through the Civil War; and, when 27 years old, formed the partnership with Mr. Sherwin, which developed into the Sherwin-Williams Company—possibly the largest paint and varnish manufacturers in the world. He was a powerful factor in most of Cleveland's great undertakings. For the past two years he has been inactive, but the story of his active life is that of an educated gentleman engaged in manufacture who gave dignity to his calling and served well his country and the community in which he lived.

—Mr. H. T. Newcomb, for the last two years editor of the *Railway World* of Philadelphia, has resigned and will resume the practice of law as a member of the firm of Ralston & Siddons, of Washington, D. C. His association with this firm will involve especial attention to the legal phases of the current problems of industrial organization as expressed in litigation in the Federal Courts and the Interstate Commerce Commission and in the work of the new Department of Commerce and Labor. Mr. Newcomb served seven years with the Interstate Commerce Commission, five in charge of the transportation investigations of the Department of Agriculture and two as chief of the Division of Agriculture in the office of the Twelfth Census. His "Railway Economics" is used as a text-book at Harvard, Yale, and other American universities, and another book, "The Postal Deficit," is a detailed study of the relations between the Post Office Department and the railroads. He is a vice-president of the American Association for the Advancement of Science, and chairman of its section on Social and Economic Science, a fellow of the American Statistical Association and of the Royal Statistical Society (Great Britain), a member of the council of the American Economic Association, and a member of the American Academy of Political and Social Science. He is one of the attorneys who represented the Philadelphia & Reading before the Coal Strike Commission.

—Mr. C. Peter Clark, who is to be Second Vice-President of the Buffalo & Susquehanna Railway, is the son of the late President C. P. Clark, of the New York, New Haven & Hartford, and was born at Jamaica Plain, Mass., in 1858. He began his railroad service on the New York & New England, of which his father was then General Manager. For three years he was traveling freight agent for the Pennsylvania at Boston, but since 1889 has been at the Boston end of the New York, New Haven & Hartford, or with one or the other of its constituent companies, the Old Colony and the New York & New England. He was for three years General Freight Agent of the Old Colony and two years General Manager of the New York & New England. Since July 1, 1898, he has been General Superintendent of the Eastern District of the New Haven, the position which he now resigns to go to Buffalo. Mr. Clark is a member of the Car Service Committee of the American Railway Association, which committee has held the guiding hand in the per diem reform, which has been carried out during the past two years. On his own road Mr. Clark has seen service in both the traffic and the operating departments. He has the high quality of mental energy which was characteristic of his father. He took a prominent part in the compilation of the new code of train rules in 1899, a code which embodies much original work, and the adoption of yellow glass for use in signals, a radical change which has led to the widespread abandonment of "white" or uncolored lights in fixed signals. In his new place Mr. Clark will have for the first year or so, a comparatively small railroad to manage, but he will have to build a new railroad of eighty miles, the company having decided to extend the line from its present northern terminus, at Wellsville, to Buffalo.



ELECTIONS AND APPOINTMENTS.

Baltimore & Ohio.—H. C. Bricker has been appointed Assistant Engineer of Bridges and Buildings.

Brunswick & Birmingham.—E. C. Machen, President, has resigned.

Buffalo & Susquehanna Railway.—This is the name of the company which is to build the extension to Buffalo of the B. & S. Railroad, and which on completion of the extension will become the operating company for the whole system. As announced last week, C. Peter Clark is to be Second Vice-President in charge of operation. The President and the other Vice-President are respectively Frank H. Goodyear and Charles W. Goodyear. The Messrs. Goodyear retain their present positions of Chairman and Second Vice-President of the old company, the Buffalo & Susquehanna Railroad.

Canadian Northern.—See Great Northern Ry. of Canada.

Charleston, Clendennin & Sutton.—W. H. Bower has been appointed General Manager, with headquarters at Elkins, W. Va.

Chicago, Rock Island & Pacific.—R. G. Brown, heretofore General Northwestern Agent, has been appointed Assistant General Freight Agent, with headquarters at Minneapolis, Minn.

Colorado & Southern.—O. J. Travis, heretofore Superintendent of Bridges of the Illinois Central, has been appointed Superintendent of Bridges and Buildings of the C. & S., succeeding A. Zimmerman, resigned. Office at Denver, Colo.

Denver & Rio Grande.—H. T. Parke has been appointed Superintendent of Car Service, with headquarters at Denver, Colo., succeeding J. D. Welsh, resigned.

Erie.—A. G. Trumbull has been appointed Mechanical Engineer and is succeeded as Engineer of Tests by J. G. Platt, with headquarters at Meadville.

Great Northern.—S. B. Plechner has been appointed Assistant Purchasing Agent, with headquarters at St. Paul, Minn.

Great Northern of Canada.—A. J. Gorrie, heretofore Superintendent of the Canadian Northern, has been appointed General Superintendent of the G. N. of C., with headquarters at Quebec, succeeding W. R. Russell, resigned. J. G. Scott, General Manager, has resigned.

Illinois Central.—A. S. Baldwin has been appointed Engineer of Construction, with headquarters at Chicago. H. R. Safford, heretofore Roadmaster, succeeds Mr. Baldwin as Principal Assistant Engineer, with office at Chicago. David Sloan, Chief Engineer of Construction, has resigned, and that office has been abolished.

Interborough Rapid Transit.—Charles Knap has been appointed Purchasing Agent, with office at New York city, succeeding M. M. Dorland, resigned.

Iowa, Illinois & Missouri.—The officers of this company, recently incorporated, are: President, George T. Cram, St. Louis; First Vice-President, George H. Boynton, Davenport; Second Vice-President, Alphons Matthews, Dubuque; Third Vice-President, Samuel G. Hallam, Monmouth, Ill.; Secretary, T. J. Medill, Rock Island, and Treasurer, A. F. Cutter, Davenport.

Kansas City, Mexico & Orient.—The new Directors of this company are: A. E. Stilwell, George J. Gould, Russell Harding, J. T. Odell, Warren G. Purdy, George Crocker and E. C. Creel.

Kansas City Southern.—F. W. Meyer has been appointed Auditor of Receipts, with headquarters at Kansas City, Mo., succeeding J. I. Morrison, resigned.

Lake Shore & Michigan Southern.—W. Rockefeller has been elected a Director, succeeding C. M. Reed.

Lehigh Valley.—W. Kells has been appointed Master Mechanic, with headquarters at Sayre, Pa.

Louisiana & Arkansas.—F. S. Carroll has been appointed Auditor, with headquarters at Texarkana, Ark., succeeding J. K. Wadley.

Mexican Central.—At a meeting held recently Enrique C. Creel, of Mexico, was elected a Director to succeed Richard Olney, of Boston, resigned.

Michigan Central.—J. P. Morgan has been elected a Director, succeeding F. S. Winston.

Nebraska, Kansas & Gulf.—The officers of this company are: H. F. Reddig, President; Morton Wellman, Vice-President; J. B. Delaney, Secretary; S. W. Jurden, Treasurer, and Wollman, Solomon & Cooper, General Counsel.

New York Central & Hudson River.—The headquarters of A. B. Taylor, Superintendent of Telegraph, have been removed from Weehawken, N. J., to Syracuse, N. Y.

New York, Chicago & St. Louis.—J. P. Morgan has been elected a Director, succeeding S. E. Williamson.

New York, New Haven & Hartford.—W. F. Merrill has resigned the office of First Vice-President of the N. Y., N. H. & H., to take effect on June 1.

Northern Pacific.—H. Blakeley has been appointed Assistant General Freight Agent, with headquarters at St. Paul, Minn., succeeding J. B. Baird, promoted.

Pere Marquette.—E. E. Hughes has been appointed Superintendent of the Grand Rapids District, succeeding J. K. V. Agnew, resigned.

Southern.—W. S. Andrews has been appointed Assistant Superintendent of the Danville Division, with office at Greensboro, N. C.

Southern Pacific.—Dr. F. K. Ainsworth has been appointed Superintendent and Chief Surgeon of the Hospital Department, with headquarters at San Francisco, Cal., succeeding Dr. M. Gardner, deceased.

Virginia & Southwestern.—J. H. McCue has been appointed Superintendent, with headquarters at Bristol, Tenn., succeeding C. O. Parker, resigned.

LOCOMOTIVE BUILDING.

The Mexican International is having 15 locomotives built at the Baldwin Works.

The Virginia & Southwestern is having three locomotives built at the Schenectady Works of the American Locomotive Co.

The National R. R. of Mexico has ordered 15 consolidation (2-8-0) and five 10-wheel (4-6-0) locomotives from the Baldwin Works.

The New York, New Haven & Hartford is reported to have ordered 25 eight-wheel (4-4-0) passenger locomotives from the American Locomotive Co.

The Hicks Locomotive & Car Works has sold two locomotives to the Council City & Solomon River; one 0-6-0 switching engine to the Bowling Timber Co. of Alabama; one 50-ton 2-6-0 locomotive to the Itasca Lumber Co., and one 40-ton 2-6-0 locomotive to the Berry Lumber Co. of Alabama. Orders have also been received from

the International Harvester Co. for one 0-6-0 switching engine, and from McArthur Bros. & Co., contractors, for two locomotives.

The Santa Fe, Prescott & Phoenix, as reported in our issue of April 24, has ordered three simple 4-6-0 passenger locomotives from the American Locomotive Co. These locomotives will weigh 137,000 lbs., with 112,000 lbs. on drivers. Diameter of cylinders, 19 in.; extended wagon top boilers with working steam pressure of 190 lbs.; 224 tubes 2 in. in diameter; Otis fire-boxes 108 in. long and 33 in. wide; tank capacity for water 5,000 gal. and oil capacity 2,500 gal.

The Chicago, Milwaukee & St. Paul is building 16 simple six-wheel switching locomotives, instead of six, as reported in our issue of May 8, and 10 simple consolidation (2-8-0) locomotives at its West Milwaukee shops. The switching locomotives will weigh 125,550 lbs., and have 19 x 26 in. cylinders, 50 in. drivers, straight boilers, with a working steam pressure of 180 lbs.; heating surface, 1,708 sq. ft.; 238 wrought iron National Tube Co.'s tubes, 2 in. in diameter and 12 ft. 5⅛ in. long; fire-box of carbon acid steel made by the Carbon Steel Co., 7 ft. 7⅛ in. long and 3 ft. 6 in. wide; grate area, 25.8 sq. ft.; tank capacity, 4,500 gallons of water and five tons of coal. The consolidation locomotives will weigh 177,000 lbs., with 156,400 lbs. on the drivers, and have 22 x 28 in. cylinders, 56 in. drivers, straight top boilers, with a working steam pressure of 200 lbs.; heating surface, 2,608.7 sq. ft.; 317 wrought iron National Tube Co.'s tubes, 2 in. in diameter and 14 ft. 6 in. long; fire-box of carbon acid steel made by the Carbon Steel Co., 9 ft. 3⅜ in. long and 5 ft. 5⅞ in. wide; grate area, 47.45 sq. ft.; tank capacity, 7,000 gallons of water and 10 tons of coal. The special equipment for both types includes: Keasbey & Mattison boiler lagging, Munton M. C. B. couplers, Sellers injectors for switching locomotives, and Ohio injectors for consolidation locomotives; Miller metallic piston rod packings for switching locomotives, and U. S. metallic piston rod packings for consolidation locomotives; U. S. valve rod packings, Richardson safety valves, Leach sanding devices, Detroit sight-feed lubricators and Railway Steel Spring Co.'s springs.

CAR BUILDING.

The Philadelphia & Reading is reported to be building 500 cars at its own shops.

The Chicago, Burlington & Quincy is building 500 box cars at the company's shops.

Isaac M. Hutchinson has ordered 10 flat cars from the American Car & Foundry Co.

The Missouri Pacific has ordered five dining cars from the American Car & Foundry Co.

The Stearns Lumber Co. has ordered 30 flat cars from the American Car & Foundry Co.

The Chesapeake & Ohio has ordered 20 palace cars from the American Car Foundry Co.

The Shreveport & Red River Valley has ordered 12 flat cars from the American Car & Foundry Co.

The Virginia Iron, Coal & Coke Co. is having 250 freights built at the Huntington Works of the American Car & Foundry Co.

The Mississippi River & Bonne Terre has ordered two passenger coaches and one combination coach from the American Car & Foundry Co.

The Hicks Locomotive & Car Works has received orders to build 25 refrigerator cars for the Chicago Great Western, and 15 freight cars for the Council City & Solomon River.

The New York Central & Hudson River has ordered from the Merchants' Despatch Transportation Co., Despatch, N. Y., 500 produce cars for July and August delivery. The specifications include Miner draft rigging, Chicago-Cleveland roofs and Symington journal boxes.

The Canadian Northern has ordered 100 flat cars of 60,000 lbs. capacity from the Merchants' Despatch Transportation Co., for June delivery. The cars will be 36 ft. long and 8 ft. 10 in. wide. The special equipment includes: Simplex bolsters and brake-beams, Westinghouse air-brakes, Miner draft rigging and Harrison dust guards.

The Canadian Pacific is building 10 coaches at its Hochelaga, Que., shops for July, 1903, delivery. The cars are to be 65 ft. long and 9 ft. 10 in. wide over frame. The special equipment includes Westinghouse brakes, National hollow brake-beams, Tower couplers, Canada Switch & Spring Company's springs, Ryan dust guards, Adams & Westlake Acme lamps, Gold heating system, Pullman wide vestibules and Standard Coupler Company's steel platforms.

BRIDGE BUILDING.

AUGUSTA, GA.—Draws will probably be placed in the bridges over Savannah River to permit navigation above the city.

BALTIMORE, MD.—It is said that bids are being asked for a bridge over Spring Gardens from South Baltimore to Locust Point, and three bridges over Gwynns Falls, to be built on the tidewater extension of the Western Maryland.

CAMBRIDGE, MASS.—The city will build a bridge over Lechmere Canal at Commercial avenue.

CONCORD, MASS.—Plans are being made for an overhead bridge.

DALLAS, TEX.—Consulting Bridge Engineer C. L. Gates is preparing plans for a new bridge on Genesee avenue.

ECORSE, MICH.—A movement has been started to have the bridges over Ecorse Creek replaced by swing bridges.

ELK RIVER, MINN.—Appropriations amounting to $23,000 have been made by the state, village and township for a bridge over Mississippi River between this place and Otsego.

ESCANABA, MICH.—The Escanaba Municipal League has undertaken to have a bridge built over Escanaba River at Wells.

FORT BENTON, MONT.—The County Commissioners will receive bids until June 4 for a 200-ft. Howe truss or combination bridge over Milk River at Bowes Ford.

GLOUCESTER, MASS.—The County Commissioners will have a public hearing June 2 on the question of a new bridge at the Cut to replace the present structure.

HILLSDALE, ILL.—Rock Island and Whiteside counties will build a $20,000 bridge over Rock River near this place.

INDIANAPOLIS, IND.—The Board of County Commissioners will receive bids until May 22 for a three-span elliptical arch bridge 198 ft. long, estimated to cost $80,000, to be built over Fall Creek at College avenue.

JONESBORO, IND.—The County Council has appropriated $14,000 for a bridge at Wilson's Ford.

JONESVILLE, MICH.—The Council has condemned the bridge over St. Joseph River, and is considering the question of replacing it with a concrete arch bridge.

KANSAS CITY, MO.—The Board of County Commissioners has ordered surveys to be made for a $30,000 bridge over Kaw river at Kansas avenue.

KERNS, MINN.—The towns of Nicolett and Judson will build a bridge over Minnesota River.

KNIGHTSTOWN, IND.—Rush County will build a $9,000 bridge over Blue River.

SOUTH BEND, IND.—The County Council has appropriated $300,000 for bridge improvements as follows: Colfax avenue, $120,000; Jefferson street, $116,000; moving Jefferson street bridge, $13,000; Cedar street, Mishawaka, $51,000.

LAPORTE, IND.—It is reported that a $10,000 steel bridge will be built over Big Creek.

L'ERABLE, ILL.—The Freeholders are considering the question of a $10,000 bridge over the river east of this place.

LORENZO, ILL.—A $30,000 bridge will be built over Kankakee River.

NASHUA, N. H.—A bridge may be built over the Boston & Maine R. R. at the Eaton street crossing.

NEW BETHLEHEM, PA.—The Town Council has petitioned the Secretary of War to order the bridges over Allegheny River raised to permit navigation.

OAK RIDGE, LA.—J. S. Rolfe, Commissioner, will receive bids until 3 p. m., June 3, for a 150-ft. steel bridge.

OMAHA, NEB.—Bids are wanted May 21 for a bridge over Central Boulevard on Leavenworth street. The bridge may be either concrete-steel arch, steel plate girder or stone arch.

OSHKOSH, WIS.—The Board of Public Works will receive bids until noon, May 18, for the North Park highway bridge.

PEKIN, ILL.—Bids will be received at the court house until 10.30 a. m., May 22, for a bridge over Mackinaw River in Mackinaw Township. B. E. Eisele, Chairman.

PEORIA, ILL.—Mayor Woodruff has asked the City Council to build a new steel bridge over Illinois River at Bridge street.

PORTSMOUTH, OHIO.—It is reported that a stone and iron bridge to cost $18,000 will be built over Loson's Creek.

PRATT, KAN.—The Township Board has petitioned the County Commissioners for a new steel bridge over the Ninnescah at the foot of Main street.

RICHMOND, MO.—W. A. Mullin, County Surveyor and Bridge Commissioner, will receive bids for a new bridge on May 16.

RIPLEY, OKLA. T.—A. J. Hartenbower, County Clerk, will receive bids until May 29 for a bridge over Cimarron River.

SKOWHEGAN, ME.—Bids will be received until 11 a. m., May 20, for a 128-ft. steel bridge over North Channel, Kennebec River. C. A. Marston is chairman of the committee.

TEKONSHA, MICH.—The township will build an iron bridge over St. Joseph River.

TIPTON, IND.—The Board of Commissioners of Tipton County will receive bids until noon, May 16, for 12 stone arches. T. W. Longfellow, Auditor.

TOLEDO, OHIO.—The Matzinger bridge over Ottawa River back of Forest cemetery has been condemned by the County Commissioners and a new bridge will have to be built. The bridge with approaches is nearly half a mile long.

WALLA WALLA, WASH.—Bids will be received until May 18 for a steel girder bridge over Mill Creek on East Main street.

WATERVILLE, CONN.—The State Committee on Roads, Rivers and Bridges has reported favorably the bill for a bridge over Naugatuck River between Litchfield and New Haven counties.

WAURIKA, OKLA. T.—Three new bridges will be built over Beaver and Cow creeks.

WESTBROOK, ME.—A $10,000 bridge may be built over the Presumpscot.

WINCHESTER, IND.—The Commissioners of Randolph County will receive bids until May 16 for eight steel bridges measuring from 40 ft. to 144 ft. each.

YORK FURNACE, PA.—The Commissioners of York and Lancaster counties may build a bridge over Susquehanna River, to replace a bridge which was destroyed a number of years ago.

Other Structures.

ATLANTA, GA.—P. T. Marye, of Washington, D. C., has been appointed architect for the new union passenger station. H. M. Steele, Chief Engineer of the Central of Georgia, has been selected as Chief Engineer of the terminal company, and the new building will be built under his direction. Bids for the station will be called for as soon as a few changes have been made in the architect's plans.

BIRMINGHAM, ALA.—The Louisville & Nashville is said to have appropriated $300,000 for establishing shops at Boyles, a few miles north of this city.

LOUISVILLE, KY.—The Louisville Ry. Co. is building a brick addition to its power plant at Campbell and Jacob streets, to consist of an engine room 60 ft. x 135 ft.; a boiler room 50 ft. x 135 ft., and a 238-ft. stack.

MILWAUKEE, WIS.—The Milwaukee Electric Ry. & Light Co. has taken out a $400,000 building permit for a new terminal station.

NORTH ADAMS, MASS.—The Hoosac Valley Street Ry. Co., it is said, will build a brick car barn 300 ft. x 60 ft.

TRENTON, ONT.—The Central Ontario will build a new three-story passenger station.

WASHINGTON, D. C.—Detailed plans for the new Union station were filed last week with the Commissioners of the District of Columbia by D. H. Burnham, Architect of the Pennsylvania R. R. The plans show an extreme width of the station of 760 ft., including carriage porticos at each side. The train shed, instead of being covered by one great arch, will have three rows of supporting pillars and three arches, which will be lower than the front of the building proper and so hidden from view. There will be 18 tracks on the main floor of the train shed, with six more leading out of the tunnel on a lower level, or 24 tracks in all. The main floor of the station building will have all the modern conveniences, and in addition private reception and waiting rooms, with a private entrance for the use of the President of the United States. On the second floor will be waiting rooms, bath rooms and other quarters for employees.

WATER GAP, PA.—The Delaware, Lackawanna & Western will build a new passenger station at the Delaware Water Gap.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ACME, RED RIVER & NORTHERN.—This company has amended its charter so as to provide for building north from Acme, Texas, to the Red River, eight miles, and southeast from Acme to Quanah, six miles. (April 3, p. 255.)

ALBANY & CATSKILL (ELECTRIC).—This company has been incorporated in New York to build an electric line from Catskill to Albany, 35 miles, passing through Athens, New Baltimore, Coeymans, Ravenna and Cedar Hill. J. M. Sheehan, L. F. Gillespie, of Newburgh, and others, are directors.

ARIZONA ROADS.—It is reported that the American Pacific Co. will build a line from Tucson, Ariz., south to Nogales, 65 miles.

ARKANSAS & CHOCTAW (ST. LOUIS & SAN FRANCISCO).—The extension of this line from Ashdown, Ark., to Ardmore, Ind. T., 200 miles, has been completed. It is announced that Ardmore will be terminus of the road for the present, although surveys have been made through the Kiowa and Comanche reservations. (See Construction Supplement.)

BASIN & ELLISTON.—It is reported that work will be begun at once on the proposed line from Basin, Mont., to Elliston, 20 miles. C. R. Tuttle, Helena, is President, and R. S. McKay, Cleveland, Ohio, Secretary. (Dec. 26, 1902, p. 992.)

BAY OF QUINTE.—Contract is reported let to P. McCoy, of Deseronto, Ont., for grading this line from Tweed, Ont., via Actinolite and Queensboro, to Bannockburn, 25 miles. (See Construction Supplement.)

CANADIAN NORTHERN.—Work is reported in progress on the extension from Clan William, Man., northwest via Shoal Lake to Rossburn, 65 miles. A. McMillan, Westbourne, Man., is the contractor. (March 20, p. 220.)

CANADIAN PACIFIC.—Work is now in progress on a temporary line, in place of the two miles of track of the Canadian Pacific destroyed by the recent enormous landslide at Turtle Mountain at Frank, Alberta. It is stated that it will require several months to complete the new work.

CAROLINA & NORTHWESTERN.—Work is reported in progress on an extension from Lenoir, Caldwell County, N. C., up Wilson Creek to the top of the mountains, 35 miles, beyond which point plans are not yet announced. J. R. Ervin, Lenoir, N. C., is Chief Engineer. L. T. Nichols, Chester, S. C., General Manager.

CHARLESTON, CLENDENNIN & SUTTON.—An officer writes that a contract has been awarded to McArthur Bros., Chicago, for grading the extension of this line from Ivydale, W. Va., up the Elk River in the direction of Sutton, a distance of 25 miles. The contract calls for the completion of the grading of the first five miles by August 1, and five miles per month thereafter. The 25 miles of grading does not complete the line to Sutton, but to a point about eight miles down the river from that place. (May 1, p. 319.)

CHESAPEAKE & OHIO.—Surveys are reported completed for a branch line of this road from the mouth of Blue Creek, on the Elk River, to the mouth of Twenty-mile Creek on the Gauley River, in West Virginia. The new line will form a connecting link between the Charleston, Clendennin & Sutton and the main line of the Chesapeake & Ohio.

CHICAGO, MILWAUKEE & ST. PAUL.—It is stated that this company will shortly begin work on an extension from Woonsocket west to Wesington Springs, S. Dak., 15 miles. Surveys for this line are reported in progress.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—Contract has been awarded to the Shutt Construction Co., St. Louis, Mo., for the grading and excavating for a second track between Lawrenceburg Junction and Sunmans, Ind., 18 miles. The contract calls for the completion of the work by Aug. 1, 1903, and involves moving approximately 2,000,000 cu. yds. of earth from the excavations and placing it in the embankments. G. W. Kittredge, Cincinnati, is Chief Engineer. (April 10, p. 274.)

COLORADO, OKLAHOMA & TEXAS.—The proposed route of this road will be from Denison, Texas, to Pueblo, Colo., about 450 miles, passing through the southwestern portion of the Chickasaw reservation, and through Comanche, Kiowa, Washita and other counties in Oklahoma. E. E. Colby is Chief Engineer, Hobart, Okla. T. (April 17, p. 289.)

COUNCIL CITY & SOLOMON RIVER.—Work has been begun on this line from Council City, Alaska, to tidewater at Solomon City, 50 miles. The Western Alaska Construction Co., of Chicago, is building the road. J. W. Dickson, the Rookery, Chicago, is General Manager. (See Construction Supplement.)

DALTON STREET.—A charter has been granted this company in Pennsylvania to build an electric line from

Providence Corners through Factoryville, Clark Summit, Glenburn, Dalton and La Plume. Rights of way are practically secured and contracts for grading will shortly be let. A. L. Nesbitt is President; James Ashley, Secretary, and J. M. Boland, Treasurer. The line will parallel the Delaware, Lackawanna & Western for part of the way.

DETROIT SOUTHERN.—Track laying is reported practically completed on the extension of this line from Lawrence Furnace to Bloom Switch, Ohio, 19 miles. The new road will give the Detroit Southern a through line from the Lakes to the Ohio River. Gilman McNeill & Co., contractors. (See Construction Supplement.)

ELYRIA, LA GRANGE & SOUTHERN.—This company has been incorporated in Ohio, with a capital stock of $80,000. A private right of way has been secured for a line from Elyria south to La Grange, Lorain County, Ohio, 10 miles, connecting at the latter place with the Cleveland, Cincinnati, Chicago & St. Louis. F. H. Foster, H. J. Ely, J. M. Starr, P. K. Clark and others, of Elyria, are interested.

ENGLAND & CLEAR LAKE.—Work will shortly be begun on this new line from England, Ark., via Clear Lake, to Laster's Landing, on the Arkansas River, nine miles. J. E. Hicks and N. B. Beakley, England, Ark., are interested. (See Construction Supplement.)

FARMERVILLE & SOUTHERN.—Work has been begun on this road, which is to be built from Farmerville, La., in a northeasterly direction to Lake Landing, Ark., about 26 miles. (April 17, p. 290.)

GREAT NORTHERN.—Rights of way are reported being secured for an extension of the Great Northern from O'Neill, Polk County, Neb., southwest to Dunning, Blaine County, 80 miles. Connections will be made with the Burlington & Missouri River at Dunning, and with the Fremont, Elkhorn & Missouri Valley at O'Neill. No official information has as yet been given out as to when this line will be built.

ILLINOIS CENTRAL.—Contract for grading the new freight and switching yard of this company south of Memphis is reported let to Chas. H. Bodkin, Memphis, Tenn. The work includes the removal of 1,000,000 cu. yds. of earth, and the laying of about 18 miles of new track.

An officer writes that no definite plans have as yet been made with regard to building a line from Jackson, Tenn., to Birmingham, Ala. (April 17, p. 290.)

JERSEY CENTRAL TRACTION.—Maps and descriptions of the extension of this line have been filed with the Secretary of the State of New Jersey. The proposed route is from South Amboy southeast via Keyport and Atlantic Highlands to Red Bank, 20 miles. The line will parallel the Central of New Jersey for a greater part of the distance.

KANAWHA & NORTHERN.—This company has been incorporated in West Virginia to build from the east side of the Elk River, near Otter Creek, to Parkersburg, 60 miles. A. W. McDonald, Charleston, W. Va.; D. S Benson, F. M. Gramm, Ivydale, W. Va., and others, are interested.

KANSAS CITY, MEXICO & ORIENT.—It is reported that track has been laid on this line from Topolobampo, on the Pacific coast, to a point 37 miles east, and that the line has been located for about 124 miles, on which 62 miles of grading is completed.

KANSAS R. R. & LIGHT.—This company has been incorporated in New Jersey, with a capital stock of $25,000,000. K. K. McLaren, L. B. Dailey and J. M. Mitchell, 15 Exchange Place, Jersey City, are incorporators. The company is to acquire and operate railroads in Nebraska and elsewhere.

KENT NORTHERN & EXTENSION.—The New Brunswick Legislature has passed an act incorporating this company with power to build from Kent Junction, on the Intercolonial, through the counties of Kent and Queens to a point near Chipman, N. B., where a connection will be made with the Central R. R. of New Brunswick. T. Ritchie, of Halifax, N. S., who recently bought the Kent Northern from a syndicate, is interested in the new company.

LAKE ERIE & PITTSBURGH.—This company has been incorporated in Ohio, to build from Lorain southeast to Youngstown, 85 miles, extending through Lorain, Summit, Geauga, Portage and other counties. W. B. Thompson, P. J. Robinson, C. L. Penny and others, of Columbus, are interested.

LAKE & RIVER.—An officer writes that this company proposes to build a line from Sandusky, Ohio, to Beaver, Pa., including the old Ashland & Wooster, and also a line from Akron, Ohio, to Youngstown. Both these lines will be leased and operated by the Lake & River. C. W. French, President of the Chicago Short Line, is interested.

MARYLAND & PENNSYLVANIA.—Surveys are now being made by this company from Bynum, Md., northeast to Conowingo, via Allibone, Dublin and Castleton, 20 miles. T. M. Ward is Chief Engineer, and J. S. Morris, Baltimore, Md., General Manager. (See Construction Supplement.)

MEMPHIS & NEW ORLEANS.—An officer writes that contracts will shortly be let for building this new line in Arkansas. The character of the work is average, with maximum grades of 10 ft. per mile and maximum curvature of 2 deg. B. L. Winchell is President, and J. F. Hinckley, 800 Fullerton Bldg., St. Louis, is the engineer in charge of the work. The line is to be built in the interest of the St. Louis & San Francisco. (May 1, p. 320.)

MEXICAN CENTRAL.—Press reports state that the section of the Monterey Division of this road between Paredon and Trevino, 19 miles, has been abandoned and the track taken up.

MEXICAN ROADS.—Surveys are reported completed for the line which the Penoles Mining Co., Mapimi, State of Durango, Mexico, proposes to build from Mapimi southeast to coal mines, 65 miles. Contract for grading will shortly be let.

MICHIGAN CENTRAL.—A contract has been awarded to Patton & Gibson, Pittsburg, Pa., for building a second track from Kalamazoo southwest to Lawton, Mich., 15 miles. The character of the work is heavy and involves a great reduction in grades and curvatures. It will probably take about a year and a half to complete the work.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—Contract for building 125 miles of the extension from Glenwood, Minn., north via Alexandria to the White Earth Indian reservation, in Norman County, has been let to Richards, Lundeen & Co., of Minneapolis. The character of the work is light. It is said that the line will eventually be extended to the Canadian boundary to a connection with the Canadian Pacific. (May 1, p. 320.)

NATIONAL OF MEXICO.—Work is reported well under way on the branch line which the company is building from Huehuetoca to Soria, 166 miles. Work is also in progress on a branch line from San Luis Potosi to Posos.

NEBRASKA, KANSAS & GULF.—This company, which was incorporated in Kansas last month, has let a contract to the Federal Construction Co. for building its line from Belleville, Republic County, Kan., south through Cloud, Ottawa, Saline and other counties, to Fort Smith, Ark. Work will be begun at once and will be in charge of J. O. Reddig, Salina, Kan. H. F. Reddig, Kansas City, is President. (May 1, p. 320.)

NEW YORK SHORT LINE.—A charter has been granted this company in Pennsylvania to build a cut-off across a portion of Bucks County, from a connection on the Philadelphia & Newtown Division of the Reading Ry., to Neshaminy, Pa. The officers are Geo. F. Baer, President; W. R. Taylor, Secretary, and W. A. Church, Treasurer. The new line will be built in the interest of the Reading, and will shorten the running distance between Harrisburg and New York two miles.

NORTHERN MICHIGAN.—It is reported that work will shortly be begun between St. Ignace, in Mackinac County, Mich., and Sault Ste. Marie, in Chippewa County, 50 miles. This new line, when finished, will parallel the Minneapolis, St. Paul & Sault Ste. Marie for about half the distance between these two points. The directors of the company are Frank Hamlin, Byron Boyden and Samuel Topliff, all of Chicago. A. L. Robinson is Chief Engineer.

OHIO RIVER & COLUMBUS.—Contract has been let to W. G. Wagenhalls, Cincinnati, Ohio, for building this line. The first section of the road will extend from Ripley, Ohio, north via Georgetown, to Sardinia, 20 miles. An extension will probably be built later to Maysville, Ky., to connect with the Norfolk & Western.

PENNSYLVANIA.—Bids are being asked for re-grading and elimination of curves on the Pittsburgh Division between Latrobe and Millwood. The work will take two years and will require a cut seven miles long, and in some places 130 ft. deep in the foothills of the Alleghenies. The amount of earth to be removed is reported to be more than 4,500,000 cu. yds.

PITTSBURG & ALLEGHENY SUBWAY TUNNEL.—This company has been organized to build a tunnel from Grand street, Pittsburg, to a point on North avenue, Allegheny, near Sandusky street, passing 20 ft. below the bed of the Allegheny River. The tunnel will be designed for two tracks for street cars, and a roadway for carriages and wagons. R. L. Henderson is President, and J. H. Armstrong, Vice-President, Pittsburg, Pa.

RIO GRANDE & SOUTHWESTERN.—Contract has been awarded to Deal Bros. & Mendenhall, of Springfield, Utah, for building 25 miles of this line from Lumberton, N. Mex., south to Gallinas, 42 miles. E. J. Yard, Denver, Colo., is Chief Engineer. (May 8, p. 336.)

SAN FRANCISCO & NORTHWESTERN.—This company has been incorporated in California to build from Alton, Humboldt County, in a southerly direction through Humboldt, Mendocino, Sonoma, Marin and Contra Costa Counties to a connection with the Atchison, Topeka & Santa Fe near Point Richmond, 200 miles. Capital stock, $15,000,000. The incorporators of the company are all Santa Fe officials.

SOUTHERN PACIFIC.—An officer writes that surveys have been made for a cut-off from a point near Oswego, Ore., northwest to Beaverton, 6½ miles, but that nothing definite has been decided on as yet regarding the building of such a cut-off. (April 3, p. 256.)

Contract has been let to Corey Bros., Ogden, Utah, for grading the new line of the Southern Pacific known as the Battle Mountain cut-off. This line runs from Piute, Nev., east to Shoshone, and leaves Battle Mountain and Argentina about two miles off the main line.

STROUDSBURG & WIND GAP (ELECTRIC).—A charter has been granted this company to build an electric line from Stroudsburg, Pa., southwest through Kellersville, Sciota, Saylorsburgh, Roscommon and Wind Gap, all in Northampton County. J. G. Honecker, Easton, Pa.; J. J. Heintzleman, Nazareth; Joseph Shiffer, Stroudsburg, and others are incorporators.

SUPERIOR & SOUTHEASTERN.—Articles of incorporation have been filed by this company for the purpose of building a railroad from Pratt, Bayfield County, Wis., on the Northern Division of the Chicago, St. Paul, Minneapolis & Omaha, and running in a southeasterly direction to a point not yet determined. J. E. Glover, L. A. Baker and G. C. Glover, of New Richmond, Wis., are incorporators.

UNION BELT LINE.—Contract has been awarded to the Southern Construction Co., Memphis, Tenn., for grading two miles of this line in North Memphis, Tenn.

WABASH.—President Joseph Ramsey announces the completion of plans for a line in the interest of the Wabash from Pittsburg to Belington, W. Va., by means of which a through line to Baltimore will be assured. The proposed route will be quite different from the Little Kanawha route, which has been abandoned temporarily. Rights of way have been practically all secured. The new line will run from Pittsburg due south to Belington, the western terminus of the West Virginia Central & Pittsburgh, 110 miles. The Wabash will use the West Virginia Central & Pittsburgh line to Cumberland, Md. From Cumberland a line will be built to Cherry Run, 60 miles, where a connection will be made with the Western Maryland, which runs from this point into Baltimore. A large number of men who have been working on the Little Kanawha line have been transferred to the new Pittsburg-Belington line. (May 8, p. 336.)

WESTERN MARYLAND.—An officer writes that contracts will probably be let within 30 days for building the connecting link of the Wabash System between the West Virginia Central and the Western Maryland railroads, from Cumberland, Md., to Cherry Run. Plans are now under way for connecting the West Virginia Central with the lines west of Pittsburg. (April 24, p. 304.)

WESTERN PACIFIC.—Surveys are reported in progress for this new line between Oroville, Cal., and Beckwith Pass, on the summit of the Sierra Nevada, and also on the eastern side of the range from Beckwith Pass to the California State line. This company was incorporated early in 1903, and it is supposed to have been organized in the Gould interest. The beginning of construction work is promised in the near future. W. J. Barnett, San Francisco, Cal., and D. F. Walker, Salt Lake City, are interested. (March 13, p. 204.)

WYOMING ROADS.—It is reported that the North American Copper Co. will build a railroad from Walcott, on the Union Pacific, south to Encampment, Wyo., 38 miles.

YOUNGSTOWN & SOUTHERN (ELECTRIC).—This company has been incorporated in Ohio with a capital stock of $1,500,000, to build from Youngstown south to East Liverpool. O. W. Jones, R. L. Andrews, J. R. Long and others, of Columbus, Ohio, are said to be interested.

GENERAL RAILROAD NEWS.

CALGARY & EDMONTON.—See Canadian Pacific below.

CANADIAN NORTHERN.—It is reported that A. D. Davidson, of Duluth, Minn., has purchased for $12,000,000 the entire land grant of the Canadian Northern amounting to 3,000,000 acres. Among others who are said to be interested with Mr. Davidson are Geo. C. Howe, Duluth; A. R. Davidson, Little Falls; A. J. Adamson, Rothern, N. W. T., and B. McDonald, Fort Chappelle, N. W. T.

CANADIAN PACIFIC.—This company has purchased the Calgary & Edmonton Railroad for $6,000,000. The newly acquired line runs from Macleod, Alberta, to Calgary, on the main line of the Canadian Pacific, and thence north to Edmonton, a total of 294 miles. It has been leased by the Canadian Pacific for a number of years, but this lease terminated on Dec. 31 last. (Nov. 14, p. 882.)

CHICAGO, ROCK ISLAND & PACIFIC.—Official announcement has been made of the plan for the purchase of the control of the St. Louis & San Francisco by Rock Island interests. On behalf of the Chicago, Rock Island & Pacific, J. P. Morgan & Co., of New York, offer to buy St. Louis & San Francisco common stock on the following terms: For each share of St. L. & S. F. stock, $60 in collateral trust 5 per cent. gold bonds of 1913, and $60 par value in common stock of the Rock Island Company of New Jersey. This purchase, however, is conditioned on 225,000 shares of St. Louis & San Francisco being deposited by June 1. The 5 per cent. gold bonds of 1913 are limited to the face amount of $18,500,000, and can be issued only to an amount equal to 60 per cent. of the par value of the stock pledged under the trust agreement. B. F. Yoakum, James Campbell, W. K. Bixby, H. C. Pierce and B. P. Cheney have all endorsed this arrangement. Mr. Yoakum will continue as President of the St. Louis & San Francisco and the road will be operated as before. Both companies will have a close traffic agreement with about 1,500 miles of Texas railroads, including the Houston & Texas Central, the Houston, East & West Texas, the Houston & Shreveport and the Dallas & Sabine Pass. The Rock Island Company of New Jersey is a holding company, formed in July, 1902, for the purpose of transferring the Chicago, Rock Island & Pacific Railway Co. to the Chicago, Rock Island & Pacific Railroad.

CINCINNATI & MUSKINGUM VALLEY.—The gross earnings of this company for the year ending Dec. 31, 1902, were $645,256 as against $574,032 in 1901, an increase of $71,224. Operating expenses were $521,882, an increase of $57,991, leaving an increase in net earnings of $13,233.

DETROIT SOUTHERN.—At a recent meeting of the voting trustees of this company an increase in capital stock from $17,000,000 to $26,000,000 was recommended. The proposition will be voted upon at the next meeting of the stockholders on May 25. The increase is to provide for an extension from Bloom Furnace to Ironton, Ohio, 18 miles now building, and for other purposes.

LAKE ERIE & WESTERN.—Gross earnings for this company for the year ending Dec. 31, 1902, were $4,699,340 against $4,533,204 in 1901, an increase of $166,136; operating expenses $3,551,365, an increase of $161,564; net earnings $1,147,975, an increase of $4,572. There was a decrease of 213,000 tons in the amount of grain moved during the year, due in large part to the partial failure of the crops in 1901. This was largely offset by increases in other classes of traffic. And the earnings per ton per mile increased from .635 to .714, or .079 of a cent. Passenger traffic shows an increase of 11.11 per cent. in the number of passengers carried, and an increase of 8.67 per cent. in earnings. The work of improving the property is steadily progressing. Arrangements have been made to re-lay 42 miles of main track with 75-lb. rails, and to continue the ballasting and other betterment and construction work during the ensuing year.

MIDLAND PACIFIC.—Kelley, Endicott & Co., of Boston, are offering at 101 and interest, $2,000,000 of the present issue of $3,000,000 first mortgage 5 per cent. gold bonds, due 1923. These bonds are a first mortgage on the line which is now being built between Sunset, Kern County, Cal., and San Luis Obispo. (March 6, p. 176.)

ST. LOUIS, IRON MOUNTAIN & SOUTHERN.—This company has purchased the St. Louis Valley and the East & West R. R., which is building from Leo Rock, Ill., on the Mississippi River, to Altamont. The *Commercial and Financial Chronicle* says: "The taking over of the St. Louis Valley and the East & West R. R. gives the St. Louis, Iron Mountain & Southern a double track for freight traffic from Poplar Bluff, Mo., to St. Louis. At Poplar Bluff connection is made with the main line of the St. Louis, Iron Mountain & Southern to Texas. The new line is 135 miles long and is the first link in the proposed Gould line from St. Louis to New Orleans."

ST. LOUIS VALLEY.—See St. Louis, Iron Mountain & Southern above.

SOUTHERN PACIFIC.—A suit for $1,000,000 taxes against the Southern Pacific has been filed in the Jefferson County Court at Louisville, Ky. The petition alleges that the corporation has not paid taxes for five years and that $1,000,000 is now due the State. Under the statutes of Kentucky, failure or refusal to pay incurs a penalty of 20 per cent. addition to the tax.

UTICA & MOHAWK VALLEY.—The State Board of Railroad Commissioners has authorized this company to increase its capital stock from $3,100,000 to $6,250,000. The proceeds of the new stock will be used for building new extensions.

WABASH.—At a recent meeting of the stockholders an issue of 5 per cent. terminal bonds not exceeding in amount $10,000,000 was authorized. The proceeds from the sale of these bonds will be used to acquire additional terminal land and property in Toledo, St. Louis, Kansas City, Chicago, Quincy, Detroit and other places, and to build freight houses and tracks and make a large number of other improvements. (April 3, p. 256.)